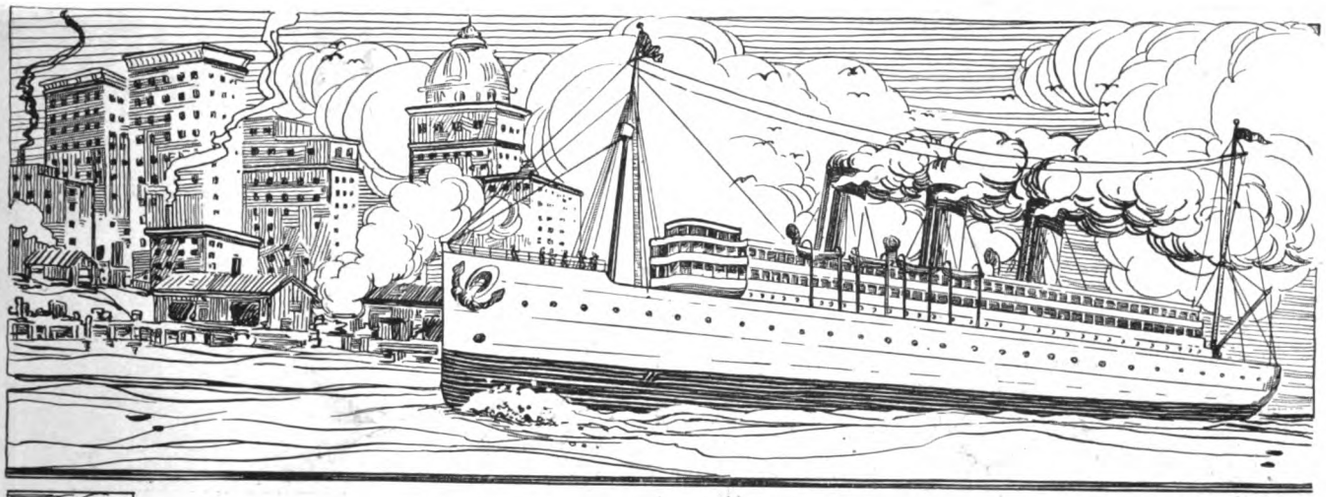

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THE MARINE REVIEW

A Monthly Publication Devoted to Shipbuilding, Marine Engineering and the Business of Transportation by Water.

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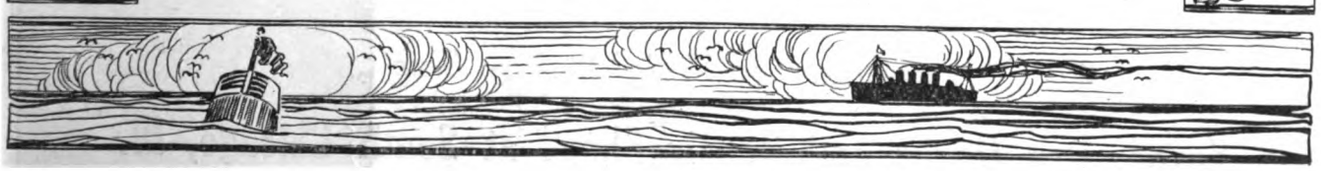

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THE MARINE REVIEW

VOL. 46 CLEVELAND JANUARY, 1916 NEW YORK No. 1

Can Ships Be Built Out of Air?

The President's Message Leads Us to Believe Government Ownership Would Result in the Miraculous Construction of an American Merchant Marine

Wilson's Argument for Government Ownership

"If other nations go to war or seek to hamper each other's commerce, our merchants, it seems, are at their mercy, to do with as they please. We must use their ships, and use them as they determine. Such a situation is not to be endured.

"The task of building up an adequate merchant marine for America, private capital must ultimately undertake and achieve, as it has undertaken and achieved every other like task amongst us in the past, with admirable enterprise, intelligence, and vigor; and it seems to me a manifest dictate of wisdom that we should promptly remove every legal obstacle that may stand in the way of this much to be desired revival of our old independence and should facilitate in every possible way the building, purchase, and American registration of ships.

"But capital cannot accomplish this great task of a sudden. It must embark upon it by degrees, as the opportunities of trade develop. Something must be done at once.

"With a view of meeting these pressing necessities of our commerce and availing ourselves at the earliest possible moment of the present unparalleled opportunity of linking the two Americas together in bonds of mutual interest and service, an opportunity which may never return again if we miss it now, proposals will be made to the present congress for the purchase or construction of ships to be owned and directed by the government, similar to those made to the last congress, but modified in some essential particulars."—From the President's Message to Congress.

LAYING aside for the moment any discussion of the remarkable tenacity that causes the President to persist in advocating a government-owned merchant marine in the face of nation-wide opposition, we are led to a consideration of some of the practical features of this scheme as disclosed in the message delivered to congress on Dec. 7. "The task of building up an adequate merchant marine for America," the President declares, "private capital must ultimately undertake and achieve. But capital," he continues, "cannot accomplish this great task of a sudden," and, "with a view of meeting these pressing necessities * * * proposals will be made to the present congress for the purchase or construction of ships to be owned and directed by the government." Right here the President displays his great weakness—an almost total lack of appreciation of the *practical* problems of commerce and industry.

If private capital working at high pressure as it is, with over 90 sea-going merchant vessels under construction at Atlantic coast yards alone, is unable to furnish tonnage fast enough to meet the present emergency, how, it is pertinent to inquire, can the government hope to achieve any superior results? Has the administration some secret control of the supernatural that will enable it to transform the evanescent ether of interplanetary space into 10,000-ton steamers in the twinkling of an eye? Or has it some clandestine contract with the forge works of Tubal Cain calling for the delivery of double-bottom, turbine-driven liners at the rate of one a day?

We agree with Mr. Wilson that the shipping emergency we are now facing cannot be relieved instantly—in fact we venture the opinion that in spite of the most strenuous efforts on the part of everyone concerned, the present shortage of vessels will last for many months to come. And in this connection we fail to see where government ownership would alter the physical facts a particle, except perhaps to intim-

(*Concluded on page 25.*)

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Marine Interests Demand Defense

Necessity for Protecting Our Sea Coasts and Commerce Emphasized at Annual Meeting of Society of Naval Architects and Marine Engineers

WITH the flames of war raging unchecked throughout half the civilized world, attention, inevitably, was focused on naval problems and questions of military preparedness at the twenty-third general meeting of the Society of Naval Architects and Marine Engineers, held in the Engineering Societies' building, New York, Nov. 18 and 19. Although many of the papers dealt solely with technical problems connected with the construction of merchant vessels, the general trend of the discussions reflected the nation-wide awakening with reference to preparedness against war. Of special interest in this connection was a paper on the maintenance of the fleet, by Capt. A. P. Niblack, U. S. N., which is published in full elsewhere in this issue. In picturesque phraseology Capt. Niblack points out the necessity for providing additional naval bases and coaling stations in order to make our fleet as effective in battle as it is imposing in peaceful reviews. He also emphasizes the need for an adequate merchant marine to develop the commerce of the United States and aid in its defense in times of national danger.

Address of Retiring President

In his presidential address, Col. Robert M. Thompson, retiring president of the society, sketched briefly the results of the return of prosperity to American ship yards; he pointed out that the United States is entering upon a period of construction that bids fair to extend well into 1917 and to add a tremendous tonnage to the American merchant marine. Inventors, he said, have been unusually active in marine circles during the past year, but unfortunately most of their energies have been devoted to purposes of destruction. In this connection he referred to the perfection of the submarine, which, he declared, the events of the war have proved, "must be in the hands of men who are entirely great." Zeppelins, he stated, have turned out to be military failures; swift battle cruisers, on the other hand, have amply demonstrated their effectiveness, and heavily armed and armored battleships have also proved their worth. The great lesson for this country to draw from the war, he stated, is that our fleet, to be effective, must be fully or nearly equal in size and fighting power to that of any enemy we are likely to encounter.

The recommendations of the nominating committee were unanimously adopted and Stevenson Taylor, vice president, Quintard Iron Works, 742 East Twelfth street, New York, was elected president to succeed Col. Thompson. Mr. Taylor is a life member of the Society of Naval Architects and Marine Engineers. The names of the newly-elected vice presidents, council members, etc., are given in a table accompanying this report.

The secretary announced that elections recently held resulted in adding one life associate member, 23 members, eight associate members and six junior members to the roster of the society. The names of these gentlemen are given elsewhere in this issue. The secretary-treasurer's report showed that the society is in a flourishing condition, with a total membership of 789 on Nov. 1, 1915, and aggregate net resources of $28,813.22.

"Aerodynamical Experiments Upon a Yacht's Mainsail," was the title of the first paper read at the meeting. It covers the details of experiments made by the author, H. A. Everett, assistant professor of marine engineering, Massachusetts Institute of Technology, Boston, for the purpose of obtaining reliable information concerning the action of sails in the wind. As a result of these experiments it was shown that "for courses from 45 to 160 degrees, with the apparent wind, shown by the fly at the mast head, the angle between the boom and center line of ship for best sailing should be approximately one-half the angle between the fly at the mast head and the center line of the ship."

The Active Gyro-Stabilizer

An exceedingly interesting paper was presented by Elmer A. Sperry, president, Sperry Gyro Co., 126 Nassau street, New York, entitled "Recent Progress With the Active Type of Gyro-Stabilizer for Ships". This paper is published in full elsewhere in this issue. Mr. Sperry spoke extemporaneously and illustrated his remarks with a working model of a gyroscope. He pointed out that the gyro steadies the ship by automatically neutralizing each wave increment, without reference to the period of the ship or of the waves. Orders have been issued by the navy department, the speaker stated, to stabilize one 10,000-ton ship and two submarines with gyroscopes. Submarines are particularly addicted to rolling, making them extremely uncomfortable unless mechanically stabilized. The active gyro may be used to cause a ship to roll as well as to prevent it from rolling and this property is utilized in the construction of large ice breakers.

The discussion of this paper brought out the fact that bilge keels, which cut down speed, may be dispensed with if a ship is mechanically stabilized. The great advantages of a stable gun platform for battleships and of general stability for passenger liners also was clearly defined in the discussion.

Describes New Barges

Inland navigation and barge construction was discussed by J. H. Bernhard, naval architect, 244 West 104th street, New York, in a paper containing many original suggestions regarding the revival of commerce on our inland waterways. The paper describes barges which it is said are to be constructed for the Inland Navigation Co.

These vessels, it is stated, will be divided into two classes, speedy and slow. The speedy barges will be 310 feet long, 56 feet wide and 9 feet deep, with a draught of 7 feet, propelled by four 600-horsepower engines, estimated to give a speed of 20 miles in slack water—22 miles downstream and 17½ miles upstream. The others, of which the first now nears completion, will be 240 feet long, 42 feet wide, capable of carrying 1,500 tons on a draught of 7 feet, and able to carry 500 tons on a draught of 3½ feet. This barge is all steel and the hold is divided into five compartments by means of four watertight bulkheads. It is propelled by means of four internal-combustion, fuel-oil, four-cycle, three-cylinder 80 brake horsepower engines built by Fairbanks, Morse & Co., Chicago, each operating one propeller. The barge is further equipped with duplicate electric power plant, and has no fire on board, the heating and cooking being done by electricity. It is also equipped with a large number of electric lights and three powerful searchlights, giving a total of 18,000 candlepower, the largest one being of 9,000 candlepower, all pilot house control.

The bow and stern are each provided with four-horsepower electric winches; the steering is done by elec-

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tricity; the pilot house is completely equipped with all modern appliances, mechanical telegraph, house telephones, spider telephone system, and a navigation telephone system. Two 5-inch centrifugal pumps, electrically operated, can quickly drain the barge and the ballast tanks.

The barge is further equipped with two refrigerating plants, one for the crew, and one for the cargo capable of maintaining a temperature of 35 degrees for a cargo of 6,000 cubic feet. The cargo space is covered by a waterproof steel cargo box, which is straddled by an electric traveling gantry crane capable of extending a boom outward on either side for a distance of 70 feet and then lift one ton. Finally, the barge is equipped with a 15-mile launch, a skiff and life raft.

"The Variation in Frictional Resistance of Ships With Condition of Wetted Surface" was the title of a paper read by William McEntee, naval constructor, U. S. N., navy yard, Washington, D. C. A paper dealing with the resistance of ships from a different standpoint was presented by E. H. Rigg, naval architect, New York Ship Building Co., Camden, N. J. Portions of Naval Constructor McEntee's paper follow:

"In considering this general subject two queries naturally arise. On actual ships what is the increase in resistance due to fouling? Is it possible to reduce the frictional resistance by modifications in the condition of the frictional surface, or by the application of materials that would tend to make the surface smoother?

"The method adopted to investigate this subject was to expose to fouling in sea water 12 10-pound steel plates 2 feet wide by 10 feet long, painted with two coats of anti-corrosive paint. The plates were placed in the water July 10, 1914, at a point in the Chesapeake bay near the navy yard, Norfolk, Va., where the water ordinarily has a density of 1.02; that is, contains about 75 per cent as much salt as is ordinarily found in sea water. The plates were removed from the water at intervals of one month, carefully packed so as not to remove any of the fouling, which consisted mostly of small barnacles, and shipped to the model basin, where they were tested to obtain the frictional resistance.

"Each plate as received at the model basin was tested at speeds ranging from 1½ knots to 8 or 9 knots. The plate was then carefully cleaned, scraped and repainted with a coat of Norfolk anti-fouling paint and retested at the same range of speeds as when fouled, and the coefficient and exponent for the clean condition determined. The fouling matter removed from plates was weighed so as to give a measure of the amount of fouling. The results indicate the importance of keeping a vessel's bottom clean and well painted, though it is not considered that the relative effect on a ship's resistance due to an equal amount of fouling would actually be as great as that obtained in these experiments, as it seems probable that the decrease in frictional coefficient due to increase of length would be relatively greater for the foul condition than is found to be the case for clean, smooth surfaces.

"At various times attempts have been made to reduce the frictional resistance of ships by lubricating the under-water surface or by polishing it to a high degree of polish with various materials. One favored method used for racing yachts is to polish the bottom with black lead or graphite. An investigation of the benefits to be expected from such polishing or lubrication has recently been made at the model basin with friction planes. The two planes used were those with which the frictional coefficients of several ship bottom paints were determined a few years ago. These planes are roughly 20 feet by 2 feet by ¾-inch, with ends sloped forward at an angle of about 30 degrees. Total wetted surface for each is about 82 square feet. The planes were sandpapered smooth and coated with shellac, and in this condition were each towed in the water at speeds ranging from 1 to 11 knots.

"One plane was next coated with black lead or graphite, which was mixed in sour milk and applied with a brush to the shellacked surface of the plane. When dry, the lead was rubbed down to a fine, smooth polish. Ten runs were made with this plane at speeds from 5.1 to 6.5 knots. The graphite seemed to cling well to the surface and showed no abrasion or wear. When wet, however, it was easily rubbed off. The next material tried was ordinary ivory soap, which was mixed as a thick emulsion in water and applied with a brush. The plane was run at speeds from 6 to 9 knots. The soap left a whitish streak in the water the first run, but not thereafter. The resistances obtained on all of the runs were consistent, so that the quality of the surface was probably unchanged during the course of the experiments.

"Two other lubricating materials experimented with were heavy cylinder oil and light cylinder oil. The oil was applied to the shellacked surface of the plane when dry with a brush, the plane being suspended over the position in which it was attached to the towing carriage, so that it could be run in the water as quickly as possible after the application of the oil. The plane with the heavy engine oil was run at speeds from 6 to 8½ knots. The observations obtained were consistent, but the slope of the resistance line when plotted on log paper indicated that at speeds of about 3 knots the frictional resistance would fall below that of the smooth, shellacked surface. This peculiarity is possibly due to the fact that parts of the oil formed in drops or globules and wavelets, increasing as the speed increased, thus changing the condition of the surface which might, if tested at lower speeds, not have given results lower than shellac. The experiments with the light engine oil indicated that for the first two runs the resistance was a small percentage greater than for the shellacked surface. Apparently as the oil was washed off the resistance decreased until the resistance agreed with that previously obtained with shellac.

"The results of the experiments indicate that no advantage over a smooth varnish or shellacked surface is obtainable with the materials used. For each lubricating surface the resistance is greater than for the shellacked surface. The resistance increases in the following order: Black lead, light engine oil, ivory soap, heavy cylinder oil."

Portions of Mr. Rigg's paper, which bore the title, "The Determination of the Resistance of Ships," follow:

"Of late years an increasing number of merchant vessels have been built with the form of stern considered peculiar to battleships and cruisers. There is much to be said in their favor and the effect on speed may well be noted here; for a given overall length this stern gives the maximum mean immersed length and a resulting decrease in power and consequently machinery weight, necessary for a given speed, varying with the size of the ship, being greater in the smaller ship. The adoption of this stern is attended with increase in stability, in deck room and in protection to screws in harbor. The chief objection is increased first cost. Appearance is another in some eyes. But small increased first cost will have a hard struggle against a possible 8 per cent saving in coal bills. The arguments are very much in favor of the cruiser stern for all twin or more screw designs, with a good chance in the single-screw design providing the draught is large. Modified cruiser sterns are common in our waters for ships that do a large

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amount of warping into and out of docks, notably in the Chesapeake bay and similar waters; also on the coast in a few cases, some Old Dominion liners being built that way. Doubtless many other instances could be found.

"Lately appendage resistance has received renewed attention; since Taylor's experiments in the Washington tank, showing the run of the stream lines on the ship models, designers have studied more carefully the placing of bilge and docking keels. Sadler's experiments on enclosed shaft bossings have also given valuable aid in properly placing these appendages. The author recalls a large vessel which had her bossing altered to better form with the result that the speed at constant displacement went up from 18 to 18½ knots. This increase in a vessel displacing over 11,000 tons was due solely to a change in the lines of the bossing. In battleships appendage resistances as high as 25 per cent of the total have been recorded. The importance of reducing this where practicable is at once evident. For more detailed information the reader is referred to Taylor's manual and to Dyson's work on screw propellers. No important vessel should be laid down without stream line diagrams at critical speeds. The fitting of anti-rolling tanks has a small and indirect effect on resistance. The result of omitting bilge keels is a saving of about 3 per cent, which is cut in half by the extra displacement due to weight of the tanks and contained water; this saving should help to pay for the tanks and controlling gear. Anti-rolling tanks, however, undoubtedly require skilled handling and constant watching whilst at sea."

In discussing Constructor McEntee's paper one speaker called attention to the rapid progress that has been made in the manufacture of anti-fouling paints in the past few years, which have now been perfected so that bottoms may be exposed for 12 months without deleterious fouling.

Taking up Mr. Rigg's paper, S. A. Savage, superintendent of construction, U. S. lighthouse service, 94 Monument street, West Medford, Mass., agreed with the author that the cruiser stern cuts down the resistance; he referred to the beneficial results obtained from modified cruiser sterns on Great Lakes freighters and also dwelt on the importance of so designing and placing hull appendages, propeller bosses, etc., so as to eliminate resistance.

A paper entitled "Results of Model Tank Experiments to Determine the Action of a Ship Brake", was read by Capt. William Strother, U. S. N. It is published in full elsewhere in this issue of *The Marine Review*.

In discussing this paper, C. L. Jennison described some experiments which indicated that the brake should be set well forward, resulting, in some cases, in a 300 per cent increase of resistance. An interesting paper on the electric propulsion of battleships was read by W. L. R. Emmet, consulting engineer, General Electric Co., Schenectady, N. Y.

"The navy department of the United States," said Mr. Emmet in part, "has awarded to the General Electric Co., of Schenectady, N. Y., a contract for electric propelling machinery for the new battleship CALIFORNIA, which is being built at the New York navy yard.

"This ship is of the largest and most powerful class which has been adopted by the United States. Her displacement is 32,000 tons and her maximum speed is to be about 22 knots, requiring about 37,000 shaft horsepower. The contract with the General Electric Co. covers two turbine-driven generating units, four propelling motors (one for each shaft), switching apparatus, cables, instruments, etc., two turbine-driven exciting units, and a complete equipment of condensing auxiliaries and ventilating blowers, all driven by motors from the exciting units. In fact it covers practically the entire engine room equipment except the main condensers. Each of the auxiliary units is of 300 kilowatts capacity with a 240 volt direct current generator geared to a high-speed, non-condensing turbine. These turbines will exhaust into the heaters, into the main turbines, or both. The motors which drive the auxiliaries will be designed for a considerable range of speed variation so that the auxiliaries will be adaptable to economical conditions at different speeds of the ship.

"The generators for the California are bipolar alternators, and the motors are arranged to be connected either for 24 poles or 36 poles. For economic cruising at 15 knots or less, one generator will be used with motors on 36-pole connection. For higher speeds the 24-pole connection will be used. The ship will be capable of operating at a speed of about 18.5 knots with one generator.

"Speed variation with either motor connection will be effected by change of turbine speeds through the agency of variable speed governors to hold automatically any desired speed within usual ranges. This arrangement, which is also used in JUPITER, entirely prevents racing and makes it convenient to hold a fixed speed irrespective of variations in sea, weather or steam conditions. It is thought that this feature will be valuable in fleet formations.

"The steam consumption guaranteed on CALIFORNIA covers the total steam required for the main turbines and engine room auxiliaries as described above. The conditions are 250 pounds gage pressure, dry steam, with such vacuum as can be produced under trial conditions. The guaranteed water rates per horsepower delivered to the propeller shafts are as follows:

	Pounds.
At 10 knots	14.6
At 15 knots	11.4
At 19 knots	11.1
Maximum speed	11.9

"Very heavy penalties are imposed in case these guaranteed consumptions are exceeded in trials, $25,000 per pound for the two lower speeds and $20,000 per pound for the two upper speeds. At full speed CALIFORNIA's propeller will make 175 revolutions per minute, this being about the lowest speed of propellers which is practicable within the space. The propeller speed proposed for the sister ships with Parsons turbine drive is 240 revolutions per minute, and comparisons by Dyson's method indicate that this speed difference will give CALIFORNIA an advantage of about 9 per cent in propeller efficiency.

"The following table gives a comparison of steam consumption per effective horsepower between CALIFORNIA as guaranteed, FLORIDA and UTAH, which are driven by Parsons turbines, and DELAWARE, which is driven by reciprocating engines. These figures are taken from the published records of trials:

Pounds of Steam to Main Engines Per Hour Per E. H. P.

	12 knots.	15 knots.	19 knots.	21 knots.	Prop. speed 21 knots.
Florida	31.8	....	24.0	23.0	308
Utah	28.7	....	20.3	21.0	303
Delaware	22.0	....	18.7	21.0	122
California	17.3	15.2	15.0	16.4	175

"Such a table as this affords the truest basis of comparison of prime movers in ships. The estimated weight of the propelling machinery without condensing auxiliaries is 530 tons, and that of the turbines originally proposed was 653 tons. The contract price for CALIFORNIA's propelling machinery with auxiliaries given above is $431,000. The estimates made at the New York navy yard indicate that this equipment will cost $200,000 less than the Parsons turbine equipment previously considered."

Mr. Emmet's paper drew forth a considerable volume of discussion on the advantages and disadvantages of electric drive as compared with direct and geared turbines and reciprocating engines. John Reid, naval architect, Whitehall building, New York, discussed electric propulsion from the viewpoint of the naval architect, pointing out that the adoption of this form of drive should hinge not only on questions of economy but that considerations of safety and convenience should also be taken into account. The safety of the vessel is greatly increased, in the opinion of Mr. Reid, by the adoption of electric drive.

Ernest H. B. Anderson, technical representative, Parsons Marine Steam Turbine Co., 97 Cedar street, New York, took issue with Mr. Emmet's figures of steam consumption and presented data tending to show different results more favorable to turbine drive. He also objected to some of the illustrations connected with the paper, particularly Fig. 3, showing proposed arrangement of turbine drive in a large battleship, which he said was not representative and incomplete.

In closing, the author defended his data and conclusions, particularly the figures of steam consumption, which he said were from official records. The traveling public of today de-

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mands and is willing to pay for pleasant surroundings and comfort whether by land or sea," stated H. B. Etter, designing draftsman, Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, in a paper on the interior decoration of vessels. "It is true," continued Mr. Etter, "that they have congenial surroundings on some ocean liners, but the American coastwise steamers, with some notable exceptions, are rarely so fortunate. I do not wish to criticize these steamers too harshly, but they are for the most part ugly from a decorative standpoint. The writer has been on board of some of them where the interior was an eyesore, when a really fine effect could have been made for a very little if any additional cost. The joiner work has to be made to suit the vessel, and it could have just for an interior a great many things should be considered, and care should be exercised to have the decoration of adjoining public rooms so one will not shock the other. All should blend together like one complete thing and yet not be alike. The interior decoration of a vessel is very often unsuited for the climate she is to trade in. The writer was once called upon to look over a steamer engaged in tropical service to see what could be done to improve her. I found the smoking room "a black hole"—everything dark, gloomy and hot looking. The other public rooms were not much better—mahogany everywhere. Why is it so many ship owners insist on mahogany or oak-paneled walls when we can get so much better results from delicate tints? In the first place hardwood walls kill the furniture; they noisseurs of art. Some of the Italian styles are beautiful and are especially suited for first class yacht work, as they are fine as to detail, mostly always carved and consequently more costly.

"Proportion is another great consideration. As the deck heights are usually too low for the size of the room, the walls should be designed to deceive this and give the impression of height. This can be greatly improved by keeping the chair rail, if there be one, as low down as possible, thereby making the upper panels the longest and preventing the squatty look. Columns and pilasters should be well proportioned and with caps and bases suitable for the shafts. It costs no more to turn a column shaft to the proper diameter in proportion to the height and to have the proper taper and fluting, than

The New Members and Their Addresses

Life Associate Member.

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as well been made to follow some good design instead of a riot of meaningless panels, moldings and pilasters. The joint work of most of these vessels is very often of the same design from end to end, bottom to top, and bad proportion at that. It must be trying to one of refined taste to have the same thing staring at him every place he goes for a week or so.

"It seems to be a mistake when a new passenger vessel is to be built if some scheme of decoration is not worked out. Of course this has been done for some of them with notable success and things seem to be improving in this respect. There are so many periods of decorative styles so suitable to be selected from for a vessel's interior, most of them not expensive to reproduce, that it seems reasonable that anything else should be discarded. In working out a successful design absorb the artificial light also, for no matter how brilliantly a vessel may be lighted there are always deep shadows and dark corners. Light colors are cheerful; they reflect the artificial light and make a good setting for rich furniture besides. Of course there are cases where light tints would not answer. A smoking room, as we all know, should not be decorated like a ball room, yet we need not have it dark and gloomy as in the vessel just referred to.

Periods of Decoration

"Some of the periods of decoration which are most pleasing and well adapted for ship interiors are Louis Quatorze, Regency, Louis Quinze, Louis Seize, French Empire, Elizabethan, the Georgian periods, Adams, American Colonial and some others not so well known by those who are not confor one ill proportioned. There are a number of books that treat of this subject, of which Vignola is considered the best.

"Cornices and moldings should have a defined profile. You often see a jumble of curves and fillets with no particular meaning and cornices too deep or with too much projection or else too little for the lower portion of the wall. Neither should they be too intricate, for, as it often happens, the forecastle hands may have to paint her some time and they are more inclined to finish quickly and leave no 'holidays' than to make a careful job, so pile the paint on thick which soon clogs the moldings and spoils their beauty. The bed moldings of cornices can be enriched if more elaboration is desired. Egg molding, dentil courses and the like are rich, pleasing, and good taste, and, as they are inverted,

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do not collect dust. These, however, should be well above the eye line to have a good effect. Panels should be large and, when made of several ply wood or one of the many kinds of composition, will not warp or crack. Small panels or those running in a brick fashion have a gingerbread look and require more labor to put together, which adds to the cost and lacks appearance."

Hog and Sag of Vessels

A paper by T. M. Cornbrooks, chief engineer and naval architect, Maryland Steel Co., Sparrows Point, Md., entitled "Data on Hog and Sag of Merchant Vessels", is presented in full elsewhere in this issue. Prof. H. A. Everett, Massachusetts Institute of Technology, discussed the paper and gave some interesting information regarding observations at the plant of the Fore River Ship Building Co., Quincy, Mass., to determine the effect of temperature on the hog and sag of ships. Prof Everett's work indicated that the deflection of a large vessel varies considerably throughout the day, due to expansion and contraction resulting from changes in temperature. To support his conclusions he presented the following figures:

Time of day. a. m.	Difference in temperature between ship's deck and water, deg. Fahr.	Change in deflection due to temperature, ft.	
4:30	9*	0.00	
6:30	+ 7†	0.04	
8:30	32	0.08	
10:30	39	0.12	
p. m.			
12:30	40	0.13	0.15‡
2:30	41	0.13	
3:30	33	0.11	

*Hull temperature below temperature of water.
†Hull temperature above temperature of water.
‡Maximum.

Elmer A. Sperry, Sperry Gyro Co., New York, said that vessels also are subject to lateral deflection due to heat.

Francis B. Smith, chief engineer, Pittsburgh Steamship Co., Cleveland, called attention to the excessive hog that frequently develops in long lake vessels due to the great difference in temperature between the deck exposed to the summer sun and the underbody immersed in almost ice cold Lake Superior water. The deflection sometimes becomes so great that the ship cannot enter the Soo canal and the difficulty is overcome by turning a hose on the deck and cooling it off before entering the lock. This causes the ship to straighten out. The maximum hog of lake vessels, said Mr. Smith, is about 6 inches, and not 10 inches.

A paper entitled "Period of Vibration of Steam Vessels", by William Gatewood, naval architect, Newport News Ship Building & Dry Dock Co., Newport News, Va., gives the results of an investigation of the vibrations which occurred in service on an oil tanker built at the Newport News yard.

"This tanker is 460 feet long and is fitted with a quadruple expansion engine installed in the stern, designed to indicate about 2,800 horsepower at 78 revolutions per minute. When running in ballast condition, no vibration was experienced. When loaded, however, longitudinal vibrations in a vertical plane were experienced with the engines at revolutions between 72 and 76. These vibrations were of the two-nodal character, and their period corresponded with the revolutions of the main engines. After several trips, the pitch of the propeller was increased so that the revolutions in service might be less than 72, and under the altered conditions no vibration was experienced. In order to investigate the matter more thoroughly, however, observations were taken on the vessel after the pitch of the propeller had been increased. The methods of taking observations were somewhat primitive and consisted of a device for measuring variations in the shape of the vessel in a vertical plane and another device for measuring the change in length of the deck plating.

"A vertical batten marked off in inches was set up at mid-length of the vessel, in line with the inner edge of the shelter-deck stringer plate. A horizontal batten was located at the height of the rail abreast the after end of the engine casing. An observing station was established at the outboard end of the breakwater near the bow. The distance from the observing station to the vertical batten was 192 feet 8 inches, and from the vertical batten to the horizontal batten was 189 feet 2 inches, a total distance of 381 feet 10 inches. This was the longest fore-and-aft sight obtainable. The method of observing was to sit on the breakwater with head against the rail and with binoculars to watch the motion of the horizontal batten past the divisions on the vertical batten.

Observation Stations

"Five stations were located for observing the stretching and compression of the shelter-deck stringer plate. No. 1 station extended from the breakwater for 90 feet aft on the line of the inner edge of the shelter-deck stringer plate. No. 2 station overlapped No. 1 station, and extended 90 feet from just forward of the bridge-house to nearly amidships. No. 3 station overlapped No. 2 station and extended 90 feet over the mid length of the vessel. No. 4 station overlapped No. 3 and extended 90 feet from forward of the mainmast to aft of the after cofferdam. No. 5 station overlapped No. 4 and extended 90 feet from after cofferdam to after end of engine casing. The method of observing was to secure one end of a steel tape to the heel of a rail stanchion and to hold the other end in the hand with constant tension, watching the motion of the 90-foot mark past a scratch on the deck plating.

"The observations took place in the Gulf of Mexico in July, 1914, with the vessel loaded with about 11,000 tons, deadweight. The revolutions of the main engine were increased from 68 to 74, when a slight vibration became noticeable. It could not be measured by the battens, but at No. 3 station the motion amounted to about 1/32-inch in 90 feet. When the revolutions were increased to 76, the vibrations were quite appreciable. The motion on the batten amounted to about ½-inch total. It was difficult to determine this with exactness, as it varied slightly, but it never appeared to exceed ¾-inch, and ½-inch seems near the true reading. The motion in 90 feet as determined by the tape line was 1/64-inch at No. 1, 1/32-inch at No. 2, 1/16-inch at No. 3, 3/64-inch at No. 4, and /64-inch at No. 5. The number of vibrations corresponded with the revolutions of the engine and could be easily counted by the motion of the tape. The type of vibration was of the two-nodal character, in which the bow and stern drop as the midship portion of the vessel rises, and rise as the midship portion drops. The nodes seemed to lie near the after end of the bridge deck-house and at the after cofferdam, but it was difficult to decide where the nodes were.

Compressive Stress

"The vibration in stress in the shelter-deck stringer corresponding to 1/16-inch variation in length in 90 feet amounts to about 1,700 pounds per square inch. The deck was already in compression, and the additional compressive stress therefore amounted to about 850 pounds per square inch. During the tests the sea was smooth. When the engines were slowed down, the vibrations ceased. When the revolutions were raised to 76 again, so that indicator cards might be taken, the vibrations reappeared, and of the same intensity as before. Here seemed to be a case of synchronism between the revolutions of the main engine and the period of vibration of the hull structure occurring in the working range of revolutions of the engine on a vessel of low speed."

The discussion of this paper brought out the opinion that vibrations can be killed, in a practical manner, by regulating the engines, by altering the propeller blades, and sometimes by a redistribution of the water ballast. Capt. A. P. Niblack, U. S. N., stated that the control of vibrations through water ballast might be of great assistance in the navy where excessive vibration makes accurate range finding difficult and where speed must be maintained to keep the ship in fleet formation. Capt. W. S. Smith, navy yard, Philadelphia, discussed vibrations on war ships and expressed the opinion that in many cases they can be eliminated by stiffening the engine foundations.

Considerable discussion took place regarding the relative vibration arising from three and four-bladed propellers. F. B. Smith, chief engineer, Pittsburgh Steamship Co. Cleveland, cited an instance of a lake vessel that

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broke off three of her four propeller blades with the result that the vibration was so excessive the captain could not continue the voyage. In another case, however, a vessel broke of all but one of her propeller blades in leaving Escanaba harbor, and not only was she able to continue on her way to Lake Erie, but she actually made the trip at a speed of 9 miles an hour as compared with a normal rate of 11 miles. Mr. Sperry described the now famous experiments of Herr Schlick on LUSITANIA and told how the vibration was traced to an improperly set propeller blade by means of the pallograph.

Among other papers presented at the twenty-third general meeting are the following: "The Application of Small Steam Turbines for Auxiliary Purposes on Board Ship," by W. J. A. London, chief engineer, Terry Steam Turbine Co., Hartford, Conn., and F. D. Herbert, sales manager, Terry Steam Turbine Co., New York; "The Submarine of Today and Tomorrow," by L. Y. Spear, president, New London Ship & Engine Co., Groton, Conn., and "Superheated Steam in Marine Practice" by H. B. Oatley, chief engineer, Locomotive Superheater Co., 30 Church street, New York.

The meeting concluded with a dinner at the Astor hotel, Friday evening, Nov. 19, at which there were many prominent speakers. Preparedness against war was the keynote of the program. Col. Robert M. Thompson, president of the society, acted as toastmaster. Initiating the evening's discussions, he said that the day is at hand when the country must be up and doing if it is to be prepared to defend itself from any possible enemy or enemies. He declared that a nation that spends $155,000,000 annually for chewing gum can certainly afford to be generous concerning so vital a matter as national preparedness for defense.

Assistant Secretary of the Navy Franklin D. Roosevelt said that he was certain the administration's defense program would go through the coming congress, while President Joseph W. Powell, of the Fore River Ship Building Co., declared that the ship builders of the country were not trying to hold up the government in the matter of warship contracts and that these ship builders realized to the fullest extent the patriotic side of their profession in doing their best to uphold and further the national defense program of the government.

H. A. Wise Wood said he could not endorse the naval program submitted by Secretary Daniels, because, in his opinion, it did not go far enough. He said the program could be likened to a compromise between two factions regarding the bridging of a dangerous stream. One wanted to bridge it and the other did not, and so they compromised by building a bridge half across the stream.

The dinner was the largest in point of attendance the society has ever held, and among those present were Major Gen. Leonard Wood, commanding the eastern department of the army; Rear Admiral Nathaniel R. Usher, the commandant of the New York navy yard; Rear Admiral Caspar F. Goodrich, U. S. N.; Homer W. Ferguson, general manager of the Newport News Ship Building & Dry Dock Co.; Stevenson Taylor; Captain A. P. Niblack, U. S. N.; Rear Admiral Washington Lee Capps, of the naval bureau of construction; Captain Gaunt, the naval attache of the British embassy; Captain Nomura, the naval attache of the Japanese embassy; Elmer A. Sperry, Henry A. Wise Wood and Captain W. Strother Smith, U. S. N.

A Grand Stand Finish

The season of navigation on the Great Lakes during 1915 was longer than usual, closing on Dec. 12. This was due to the fact that the movement did not get well under way until August and a vast volume of freight had to be moved after that date. Underwriters, foreseeing the situation, announced early that they would extend insurance until Dec. 12 under excess rate of 1 per cent. This is the first time that such announcement was made before Nov. 30. In the past this has been predicted on weather conditions from Nov. 30, but this year the insurance was extended and the matter of weather left to the judgment of the masters of the vessels. While ore was moved at a flat rate all season, some slight premiums were paid for the movement of coal to Lake Michigan during November. The grain rate, however, was a perfect bonanza to vessel owners all summer and fall. The grain market was really of a runaway character, the rate mounting to 6 cents early in the fall, when 2½ cents is the usual figure for that time of the year. Several of the large class of vessels made small fortunes on each trip. The grain rate was really better during the fine sailing of October than it was in the heavier weather of November, but it was high enough all fall for vessel owners to earn excellent dividends on their investments.

The ore rate for 1916 has been fixed at 10 cents above the rates for 1915, or 50 cents net to the ship from the head of the lakes, 45 cents from Marquette and 35 cents from Escanaba. In addition, ore prices have advanced 75 cents per ton over the 1915 rate and it is expected that by the first of the year sales approximating 50,000,000 tons will have been made. The predicted ore movement for 1915 is about 55,000,000 tons and the existing fleet is well able to take care of it, though the coal shippers will doubtless be squeezed for tonnage.

The season ended with only four total losses of vessels, which is a very good record. The underwriters have enjoyed a profitable year.

More Ship Building

Foreign shipping companies have figured in an important way in further contracts for vessel construction placed during the last few weeks with Atlantic coast and other yards in this country. Norwegian interests have placed orders for six vessels. Two of these were placed with the Camden Ship Building Co., which several months ago acquired the old Roach ship building plant at Chester, Pa., and has carried out the extensive rehabilitation of the plant. This is the first large order that this yard has taken. These vessels are to be turbine-driven of about 10,000 tons displacement each. The same buyers have closed with the American Shipbuilding Co. for four boats which will be of a size permitting them to pass through the Welland canal. It is said that this is the first time American yards have been able to compete with foreign builders for Norwegian construction.

The Standard Oil Co. continues to be a large builder of tank ships. Within the past several weeks, it has closed contracts for four additional vessels of this type, two of which will be constructed by the Maryland Steel Co., at Sparrows Point, Md., and two by the Harlan & Hollingsworth Corporation, at Wilmington, Del. These boats will be about 10,000 tons gross each. The A. H. Bull Steamship Co. has ordered two 5,000-ton vessels from the Maryland Steel Co.; the Coastwise Transportation Co. a 12,000-ton boat from the New York Shipbuilding Co.; the Munson line two 5,000-ton boats, one from the Maryland Steel Co. and the other from the Newport News Shipbuilding & Dry Dock Co. The Matson Navigation Co. has placed a 9,000-ton boat with the Union Iron Works. Recent awards raise to about 90 the number of vessels placed with Atlantic yards since the present active ship building movement was inaugurated a year ago. All leading yards are busy.

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Photographs From Far and Near

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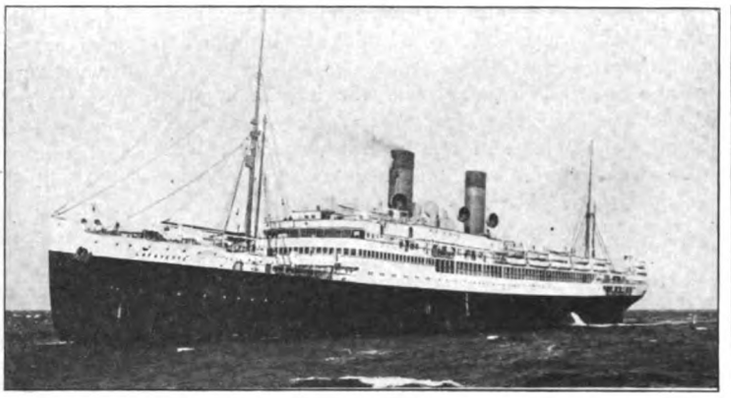
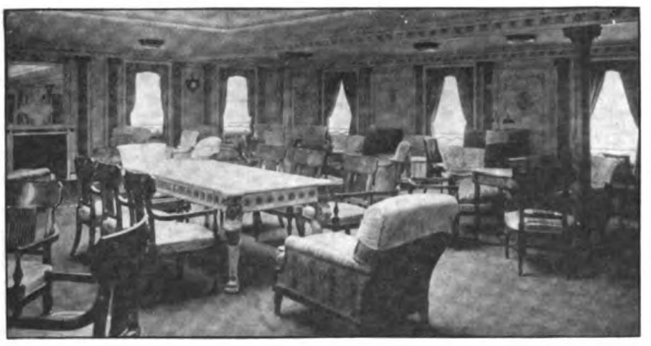
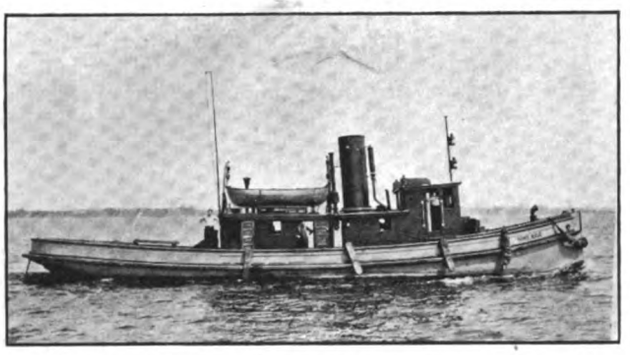




THIS FRENCH LINER WAS CONSTRUCTED DURING THE WAR

In spite of their heroic struggles against the invader, the French have found the time to complete the fine quadruple screw ship LAFAYETTE, which recently arrived in New York on her first trip from Bordeaux. She is of 18,000 tons displacement and 20,000 horsepower. The reception room of her grand suite, and the first class drawing room are shown at the left; while at the right are depicted a detail of the grand staircase and the children's theater on board, with the "actors" in their places

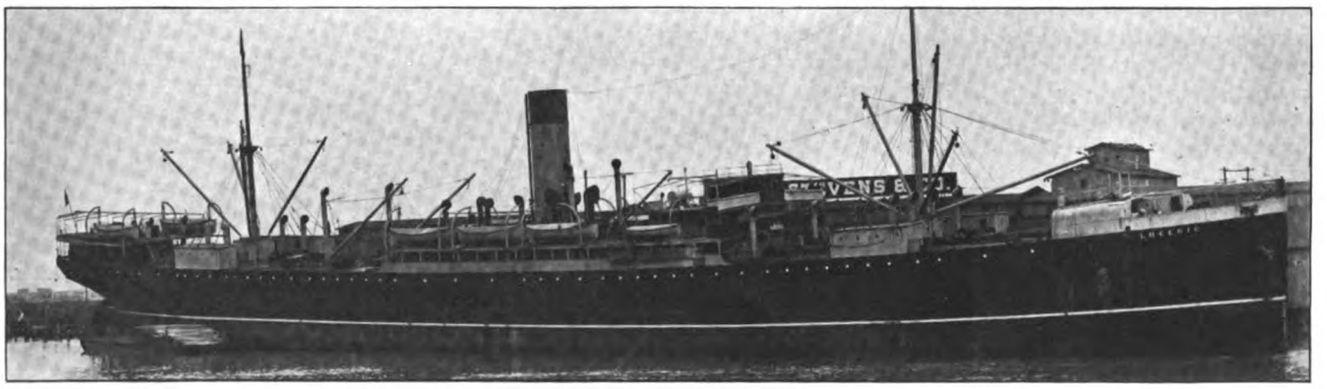


A STURDY LITTLE FREE-LANCE GREAT LAKES TUG

HOME RULE doesn't wait for orders from a central office to give her employment. She finds plenty of work for a tug of her size, 'roundabout the waters of Lake Ontario and the Saint Lawrence river.

A SURVIVOR OF A GREAT NEW ENGLAND FLEET

DIRIGO, one of the last of the famous old Sewall squadron of Bath, Me., is shown here as she appeared at Seattle, on the eve of starting for Sweden with a grain cargo. She is a former fleet-mate of WILLIAM P. FRYE, sunk by the Germans.



LUCERIC READY FOR A HUGE WHEAT CONSIGNMENT AT TACOMA

This is one of the largest freighters calling at Puget sound ports. Shipping on the Pacific is at a premium just as it is on the Atlantic and cargoes often have to wait for days

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Latest Marine News in Pictures

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HANDSOME NEW TUG FOR GREAT LAKES SERVICE

Built to the order of the Canadian Stewart Co., Toronto, J. C. STEWART is 81 feet 9 inches in length over all, with 20 feet beam and 10 feet 6 inches molded depth. She is equipped with fore and aft compound engines with cylinders 14 x 30 x 24 inches stroke. Johnston Brothers, Ferrysburg, Mich., who built STEWART are responsible also for her Scotch marine boilers, 10 feet in diameter and 11 feet in length.

LIFE PRESERVER SUIT

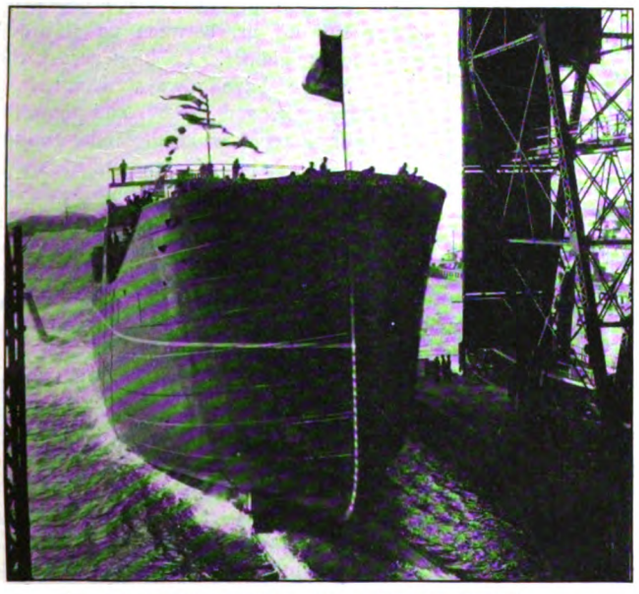
A. Youngren, of Wyoming, invents waterproof buoyant costume equipped with water and food supply.

STORM-DEFYING "HAND LINER"

In such ruggedly designed and built power boats the Italian and Portuguese fishermen of Boston earn their living regardless of the weather.

A MAJOR OF WATER POLICE

The harbor board of Baltimore recently purchased THE MAJOR. She is 30 feet long, 8 feet beam, and is powered with a 20-35-horsepower Sterling engine.



LAUNCH OF THE COLLIER VIRGINIA

Built for the Pocahontas Navigation Co. by the New York Shipbuilding Co., VIRGINIA is 319 feet long with a beam of 49 feet 3 inches and a load draft of 22 feet 8 inches. Her gross tonnage is 3,625. She will be used in the coastwise coal carrying trade

TRULY "A SEA-CHANGE"

JOHN G. MCCULLOUGH, recently sold on the Great Lakes for ocean service, has lost her Spartan simplicity of rigging and is now equipped with the multiplicity of booms and cargo winches demanded by her new duties. The deck houses have been moved aft.

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"Preparedness" and Naval Problems

The Resolute Policy to Which Geographical Circumstance Has Committed This Country—Great Opportunities for Defense on the Pacific

By Captain A. P. Niblack, U. S. N.

THE first line of the national defense is diplomacy, which, for safety and to avoid misunderstandings, should be in the hands of skilled if not specially trained men. Due to our geographical position, our second line is the navy, which must ever be prepared to act on the offensive, as its chief value lies in mobility and initiative. The third line is the sea coast and other fixed defensive, with a mobile land force to protect the land approaches. From its immobility this third line is essentially defensive. The fourth line is the regular army, which, like the navy, is essentially offensive. The fifth line is the trained reserve, and that we have not. As patriotic and as self-sacrificing as are the individuals who compose the militia, no thinking person, with knowledge of the facts, can count the militia as a trained reserve. For all that it is, we should, however, be deeply thankful. The sixth line is the reserve of equipment—guns, ammunition, clothing, food and fuel—together with the manufacturing establishments to turn out whatever additional is needed, from a button to a battleship. Untrained men, as a war asset, are like ore in the mine, cotton in the bale—simply a valuable raw material. The dear old lady who is represented as singing "I didn't raise my boy to be a soldier" is quite right; and she was wise not to undertake it. It takes several years of special training to make a soldier, and it is the duty of the general government, and not even of the various states, to undertake this. She had her work cut out for her, in getting her boy through the mumps and measles.

The Fallacy of Fat Complacency

We are prone in this country to regard ourselves as a rich nation. My experience with rich people has been such that I have come to regard mere riches as a severe test of character. Money is certainly not a war asset until it is actually invested in the creation of war material and trained personnel. It is, however, a good thing to use in paying war indemnities, and in that respect we have an attractive bank account. Money not spent in preparedness for war, if no war comes, is not necessarily money saved, for, unhappily, the ideas which spring up like weeds around the noble aspirations of universal peace always tend to sap, strangle and kill the national stamina and deteriorate the national character, whereas the recognition that every citizen owes spontaneously his services to the country in time of war, and hence in time of peace in preparation for war, is an asset independent of national wealth and infinitely more valuable. Except China (and it is almost to late for her to lock the stable door), Great Britain and the United States are the two remaining countries in all the world which cling to the voluntary system of enlistment, because, setting the individual above the state, the individual has been clever enough to avoid the discomfort, the loss of time, and the interference with his pleasure and business which universal military service demands. As Rudyard Kipling recently said, we expect to raise armies "by the same method we raise money at a charity bazar. We profess to believe that in the hour of danger there will always be enough men ready, of their own free will, to defend the country." The voluntary system, however comfortable to the millions, is enormously expensive, unfair, clumsy, unreliable and generally unsatisfactory. Drafting by lot in times of stress is only a palliative, as shown by the disgraceful draft riots at the opening of the Civil War. In countries in which there is conscription there are at least no strikes in government munitions factories and shipyards.

However, we all get, in the end, what we deserve; and, when the final reckoning is paid in the war now going on in the world, we may even be able to estimate accurately the relative cost of being, say 100 per cent ready for war as compared with 30 per cent; and we may even find ourselves, somehow, helping to pay the piper. Whatever legitimate differences of opinion, therefore, we may have as to our national policies as a world power, it would seem to be best, instead of discussing the subject of the maintenance of the fleet on the high plane of patriotic or civic duty, to apply the acid test of business, or what pays best in the end.

The Policy of the Hermit Crab

In the first place, geographical circumstance has placed a large ocean on either side of us, between us and our powerful neighbors. Looking across the Atlantic, we have always accepted a defensive role, and talked, and thought, and built to repel an enemy if he should come. This habit of thought, of waiting for something, of holding back, of expecting things to come to us, has almost destroyed our initiative, has kept back our foreign trade, and almost driven our flag from the ocean. We have reasoned that our fleet would give us time to bring up our supposed reserves and enable us to raise an army of volunteers. Facing this comfortable solution, we have turned our back upon the Pacific.

Geographical circumstance, acquisitiveness or destiny has presented us in the Pacific with Alaska, the Hawaiian islands, Tutuila (Samoa) island, Midway island, and Guam, as stepping stones across the Pacific, and, by their possession, imposed upon us the same policy

A Call to Destiny

THE death of Lord Roberts, England's great military hero of the Victorian age, came not too soon to bring to the brave old fighter the realization that his warnings to England were all too well merited. Lord Roberts would have died happy, had he known that his prophecies had been heeded and that England stood ready for the menace across the North sea. But now his memory is doubly enshrined in the hearts of the British people. In striking contrast to the almost despairing tone of the venerable "Bobs'" last appeals to his apparently deaf countrymen, is this ringing demand for preparedness issued by Capt. Niblack, an American naval officer who has made an extended study of the Pacific ocean as the future fighting ground for our country's "far-flung battle line". Dry and stinging though his wit may be, it nevertheless points the truth of a healthy propaganda full of optimism and courage. Such might have been the optimism of Lord Roberts before age and despair had brought him to feel so deeply the futility of attempting to arouse his people. Let us hope that the counsel and warnings of our sturdy and far sighted naval officers will not be so wofully disregarded as we have seen illustrated in the tragic object-lesson across the Atlantic.

A paper read at the twenty-third general meeting of the Society of Naval Architects and Marine Engineers, New York, September, 1915. The author is vice president of the society.

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as if they were actually in the hands of an enemy or rival, because they exist and cannot be sunk; and if we fail to make the right use of them geographical circumstance will turn them against us, just as it turned them away from others and to us. The Pacific permits to us no defensive policy such as we have softened ourselves to in the Atlantic. Our coast line extends to Guam, even if we should scuttle in the Philippines. We can wiggle, and squirm, and make a wry face over paying the bill, but we can never evade ultimately the cost of adequately fortifying a naval base in the island of Guam, and in a lesser degree in the island of Tutuila, in the Archipelago of Alaska, and on Midway Island, just as we have already begun the good work in the Hawaiian Islands and at Balboa at the Pacific end of the Panama canal, the reason being, if there were no other, to prevent their being used against us as commercial supply stations or naval bases by an enterprising rival or enemy. Besides, it will pay us to do so.

Suppose that on Jan. 1, 1916, there should be assembled off Panama, in the Pacific, a fleet to make a leisurely voyage to Manila and return by way of Honolulu, Midway and Guam. Let us assume that this fleet consists of 30 battleships, 20 of our largest cruisers, now mostly out of date because deficient in speed, 40 destroyers, 20 colliers, three supply ships, and the fleet repair ship VESTAL.

Circumstances of Voyage

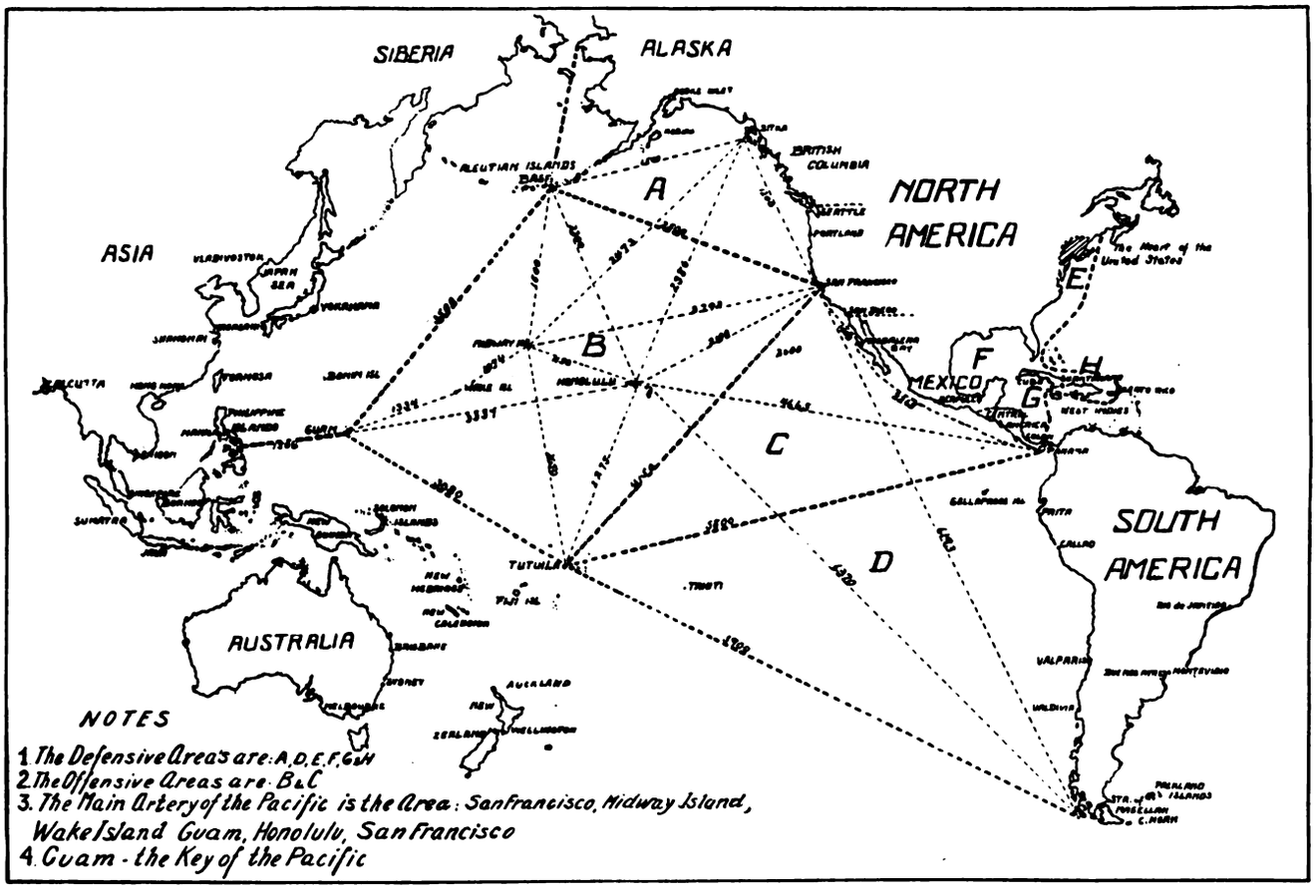
In order that we may elucidate the problem of supplying this fleet in its simplest form, the speed is 10 knots, no bad weather is encountered, there are no delays from break-downs, and the time to overhaul machinery, etc., is placed at an absurdly low figure. As the stretch from Panama to Honolulu is 4,685 miles and would necessitate towing some of the ships of lesser coal endurance, and, as touching at Magdalena bay would only be 125 miles more than the direct route, this stop is made. Stopping at San Diego, instead, would made a difference of 436 miles.

Coal Supply Required

We have at Balboa a fine refueling plant and an embryo naval station, and the fleet is supposed to sail from there full of coal and fuel oil. The assumption is a very liberal one that 18 tons of coal and 3½ tons of oil per mile will cover the fuel consumption of the battleships, cruisers, and destroyers at sea at a speed of only 10 knots, and that 1,000 tons of coal and 160 tons of oil will cover their daily consumption in port. According to *London Engineering* the average collier or freighter will burn 1/6-ton of coal per mile or ⅛-ton of oil and will burn about 12 tons of coal, or ten tons of oil in port per day. Our battleships carry nearly 40 days' fresh provisions, and five months' dry provisions, and the three refrigerator supply ships CULGOA, GLACIER and CELTIC may be emptied on reaching Guam, proceed to Sydney, Australia, 3,000 miles, to fill up, and return to the island of Guam, where they would meet the fleet on its return voyage. The following is the calculated coal consumption for the outward voyage of this suppositional fleet:

	Sea miles.	Coal, tons.	Oil, tons.
Panama to Magdalena Bay	2,265	49,000	8,500
In port 5 days...	.....	5,000	800
Magdalena to Honolulu	2,543	55,000	9,500
In port 5 days...	.....	5,000	800
Honolulu to Guam via Midway..	3,450	74,700	13,000
In port 10 days..	.....	10,000	1,600
Guam to Manila...	1,542	33,500	5,800
In port 10 days..	.....	10,000	1,600
Total	10,000	242,200	41,600

Taking from the *Naval Pocket Book* the bunker capacities of all the ships enumerated as comprising this fleet, adding to it the carrying capacities of coal and oil of the 20 colliers, and comparing the sum with the consumptions of



STRATEGIC MAP OF THE PACIFIC OCEAN

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fuel in the foregoing table, we have a result which is as follows:

	Coal, tons.	Oil, tons.
In bunkers	129,000	16,900
As cargo	120,000	38,100
Total	249,000	45,000
Consumed as per table	242,200	41,600
Margin	6,800	3,400

It should be stated that the two new oil carriers KANAWHA and MAUMEE, now ready for service, are included in the list of colliers. These two help to swell the figures for oil by 18,244 tons. The margin remaining as above is uncomfortably small and we are at once confronted with the problem of 240,000 tons of coal and 40,000 tons of oil required to get the ships back to Balboa. The bunker coal for the colliers can be gotten from Singapore or Australia, but only "Welsh" or "Pocahontas" class of coal serves for naval use. The problem, as elementary as it may seem, is extremely complicated even in time of peace. What it would be in war is another matter, but it illustrates the profoundly gratifying fact that we have wisely given our ships a large steaming radius, and, more wisely still, gone in for government-owned colliers and supply ships, while every other navy in the world has to rely on chartering. With adequate supplies of coal and oil at Honolulu, Midway and Guam, we may attain the desired mobility of the fleet even in war, provided we adequately fortify Guam and Midway. The cost would not exceed that of one battleship.

The Problem of Auxiliaries

In time of war the high speeds required in scouting and protecting would increase enormously the demand for fuel, and the 10 knots speed for the fleet shows how narrow is the margin as it gives the very minimum, easily increased by leaps and bounds under stress of weather or war operations. It is estimated that probably 200,000 tons of coal a month would be required along this route in time of war. Two things stand out clearly in this problem, viz., the necessity for adopting the system of towing and coaling at sea so ably and so often advocated in the meetings of the Society of Naval Architects and Marine Engineers, and the need of replacing our old colliers, supply ships and cruisers with newer, larger and faster ones. These colliers, repair and supply ships, fitted with 5-inch and 6-inch guns and officered and manned by regular officers and men, should be able to give a good account of themselves in time of danger and would not need the sheltering and shepherding that must be given to a heterogeneous lot of chartered and irresponsible craft, none too reliable under the most favorable circumstances. This leads up to the question of either purchasing additional colliers and supply ships, or building them, as we cannot rely on chartering because we will need all the available merchant ships for other purposes, as our expanding foreign trade, and the maintenance of what we have. A purchased ship will require at least two months to overhaul and adapt her to government requirements. During the "war with Spain" we purchased colliers having a gross tonnage of 42,500 tons at a cost of $76 per gross ton. Economy and serviceability point to the entire desirability of building ships for the special service required. We have worked out and know every detail of what we want as colliers, oilers, refrigerator, repair, transport, water tank, ammunition, and hospital ships, torpedo-boat destroyers and submarine tenders, mine layers, mine sweepers, merchant scouts, aeroplane transports, tugs, coal lighters, and buoy tenders.

In supplies are included reserve ammunition, medical stores, fresh and dry provisions, clothing, equipment, fresh water, "canteen" stores, both afloat in supply ships and at the naval bases. Fuel means the ability to deliver the blow without delay. Delay means the loss of the initiative. Operations can only be based on available means, and, in modern war, you cannot plan and then assemble stores to execute the plan. After war is declared it becomes a question of supplies and weapons at the front, or else falling back on the defensive and trying to gather from every source the supplies needed even for the defensive. With fortified island bases, each would become a stepping stone to the next, and a center from which to sally forth, attack and harass, and to which to return for supplies, rest and overhaul. Our real coast line would become, as it were, more remote from our enemy as these obstacles in his path hindered his free movements; and, on the other hand, these island bases would have the effect of extending our coast line out into the ocean for our own forces. As sources of supply they are as valuable to the enemy as to us, unless we fortify them adequately and defend them with submarines, torpedo boats and mine devices.

All this sounds like the stock language of the rampant militarist looking for and bringing on trouble, but is simply the cold business of insurance against and avoidance of trouble through prevision and provision. There is, moreover, no reason in forbidding business in freight relations, or diplomacy in making for markets and trade opportunities. Tutuila, Midway and the Aleutian islands come into the question of island bases as auxiliary centers of supply and security, or as centers of scouting and offensive, not to mention commercial operations. Over and above all lies Guam in its position of unique, commanding and supreme importance, the "Key of the Pacific." On what we do there depends our future on that ocean, and as a peaceful, law-abiding and properly respected member of the community of nations. If we rise to the occasion, no one can take the Philippines if we should let go, or drive us out until we choose to go in our own time and in our own way. Geographical destiny is knocking loudly at our door.

No one can trouble the fishing industries and rich coal fields in our storehouse of the future in Alaska, if there is a fortified base in the Aleutian archipelago. Tutuila, 5,700 miles from Panama, 2,276 from Honolulu, 3,159 from Guam, and 4,500 from Manila, is only 1,565 miles from Auckland and 2,377 from Sydney, with their supplies of fresh provisions and coal. The Panama canal has made its beautiful landlocked harbor a priceless heritage in our manifest destiny in the Pacific. Midway, at present an indispensable cable relay station, 1,150 miles beyond Honolulu, near the route to Guam, has a harbor with a bar good for 17 feet draught now, and which the cost of one cruiser would convert into an auxiliary fortified and equipped island base. Many visits, in connection with constructive work and planning, have made its every feature familiar and of deep interest to me, and I look forward to the time when wise foresight will guard this vulnerable outpost in the ocean on which our future lies.

Preparations Not Costly

All this talk of fortification and equipment means less than the cost of two battleships, and without which the battleships are restricted to operations from bases improvised after war is declared. The money spent annually in soda water, chewing gum and candy, if spent on reasonable military necessities, would put us in the hated class of the "prepared." The cost for one day of the war now going on in the world would secure the Pacific coast from invasion for all time. Everyone knows this, but like the Jews of old we consider ourselves the chosen people, and the voices of those who could pilot the job are as those crying in the wilderness of local politics.

The question of maintenance of the fleets is separate from that of organization, training and operation. But as to the supply of trained officers and men, as effecting the maintenance of the fleet, so many more than the present num-

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ber could be utilized to advantage, and so much remains to be done, that it is best not to discuss it. As short-handed as we are the training goes on incessantly, as it should, and the spirit of competition keeps anyone from getting a swelled head as to being the latest prodigy in any line of endeavor. Many prizes are given and adherence to rules, in competitions, like obedience to orders, is ingrained. The science of getting the most out of each ton of coal and gallon of oil, under the spur of competition, has, as an example, enabled two of our first dreadnaughts to make a knot more speed in full power than their contract, and cut the coal consumption in port in half, as compared with their first year in commission. Every battleship in the fleet can today make her contract speed and most of them can exceed it.

Suppose we had a supreme council of war, whose composition commanded the confidence of everyone. The result would be that people would say, "The council says this must be done," and everyone would accept it as a national necessity. The council might say, "We must have an interior water-way from Cape Cod bay to the Gulf of Mexico for urgent strategic reasons," or "In every other country in the world the coast defenses are under the navy, in order to insure co-ordination. The coast artillery corps must be transferred to the jurisdiction of the navy, just as the marine corps now is." In fact it is just the knowledge that such recommendations would be made that keeps us from getting the council of national defense. As a friend of mine use to say, "When pain or fear wrench hard enough on the purse strings, the doctor gets called in," and like the sick man we can only hope that it will not prove too late, if necessity ever forces the calling together of such a council.

Of the 17 paragraphs of the constitution of the United States which define the powers of congress, nine of them deal with providing, organizing and maintaining "the common defense" in such uncompromising language as seems to voice the suspicion of its framers as to the probable location of the lamb on that great day when the lion and the lamb shall lie down together, and even to suggest that the happy after-dinner speech of the lion is not a safe basis for framing a policy of national defense. The founders of this nation even seemed to suspect that a federation of states would not, as a form of government, sufficiently maintain preparedness, and therefore took great pains to fix the responsibility on the legislative branch of the general government. If it is true that the people really rule this country—and they are constantly told they do—and yet shrink from facing issues which involve any sacrifice of their time, pleasure or comfort, then the standard of citizenship is perilously low, and government by the people is seriously on trial.

Old Skipper Passes

Captain Albert R. Manning, one of the last of the old guard of stalwart lake sailors, died Nov. 27 at Cleveland, in his eighty-first year. He was born in England, but settled on the lakes as a small boy, shipping on a schooner at the age of 14. Captain Manning's first command was obtained in 1853. Six years later he took the schooner J. F. WARNER to Glasgow direct from Cleveland with a cargo of barrel staves, this being one of the first transatlantic ships direct from lake ports. Among the vessels that he commanded were OCEAN WAVE, DANUBE, AMERICAN EAGLE and HINCKLEY. Captain Manning entered the marine insurance business in 1871, being a member of the firm of Brooks & Manning for more than a quarter of a century. At various times he held the position of vice president of the Cleveland Board of Trade, president of the Cleveland and the Ohio board of fire underwriters and the Lake Marine Underwriters. He retired in 1910 from active practice.

Old time Great Lakes sailors who were intimate with Capt. Manning declare him to have been a vessel master of the highest order, a business man of the most honorable class and in general a broad-minded, sensible and courteous gentleman, never boisterous but always ready to advise and assist others over the rugged and oftimes stormy paths of life.

Motorship Carries Oil

The motor vessel PANAMA recently reached Amoy, China, with a consignment of kerosene for the local agents of a Texas oil company. PANAMA was completed in March of this year, and is owned by the East Asiatic Co., Copenhagen, Denmark. She is 427 feet long, 55 feet beam, and 38½ feet depth, with a carrying capacity of 9,000 tons, and was built at a cost of $400,000. She is equipped with two 1,750-horsepower diesel engines, three auxiliary engines for lights, electrically driven winches, electrically driven steering gear, and an air compressor. At a 12-knot speed, 11 tons of crude oil are consumed in 24 hours. This vessel started from Port Arthur, Tex., on her initial voyage with a shipment of 230 cases of oil, the cases containing two tins of five gallons each. The freight on this oil is stated to have been about one-third the cost of the vessel.

Ore Shipments

Lake Superior ore shipments during the month of November totaled 4,445,129 tons, an increase of 3,376,448 tons over the movement of the corresponding period in 1914, when the mine sent forward 1,068,681 tons. The December movement also showed a big gain over December of last year, being 57,236 tons as against 1,411 tons. The total shipments for the season of 1915 were 46,318,804 tons, showing an increase of 14,296,907 tons over the movement of 1914, and being only 1,116,973 tons short of the shipments of 1912, and 2,751,674 tons of the shipments of 1913, which was the largest movement on record. The movement of 1915 is regarded as phenomenal since the trade did not really open until August and consequently an enormous volume of freight was moved from then until the close of the season. The last ore cargo of the season was carried by the steamer JOSEPH WOOD from Superior on Dec. 7.

Following are the shipments by ports for the months of November and December and for the season of 1915, together with corresponding data for 1914:

Port.	November, 1914.	November, 1915.
Escanaba	222,048	696,346
Marquette	104,147	263,386
Ashland	133,673	451,020
Superior	389,279	958,465
Duluth	121,248	1,328,848
Two Harbors	98,286	747,064
Total	1,068,681	4,445,129
1915 increase	.....	3,376,448
Port.	To Dec. 1, 1914.	To Dec. 1, 1915.
Escanaba	3,663,040	5,636,427
Marquette	1,755,726	3,099,589
Ashland	3,363,419	5,146,772
Superior	11,309,748	8,307,381
Duluth	6,318,291	15,437,419
Two Harbors	5,610,262	8,633,980
	32,020,486	46,261,568
1915 increase	.....	14,241,082
Port.	December, 1914.	December, 1915.
Escanaba	1,411	12,862
Superior	.....	35,412
Two Harbors	.....	8,962
	1,411	57,236
1915 increase	.....	55,825
Port.	Season 1914.	Season 1915.
Escanaba	3,664,451	5,649,289
Marquette	1,755,726	3,099,589
Ashland	3,363,419	5,146,772
Superior	11,309,748	8,342,793
Duluth	6,318,291	15,437,419
Two Harbors	5,610,262	8,642,942
	32,021,897	46,318,804
1915 increase	.....	14,296,907

Ship building in the Netherlands was active during the first half of 1915. Fourteen new steamships and one motor boat, of a total net tonnage of 31,055, were completed, and 64 steamers, of 269,000 net tons, were under construction at the end of June. In addition six steamers, of 12,432 net tons, were bought from foreign yards. The Netherlands merchant marine, on June 30, 1915, included 460 steamers of 890,964 net tons.

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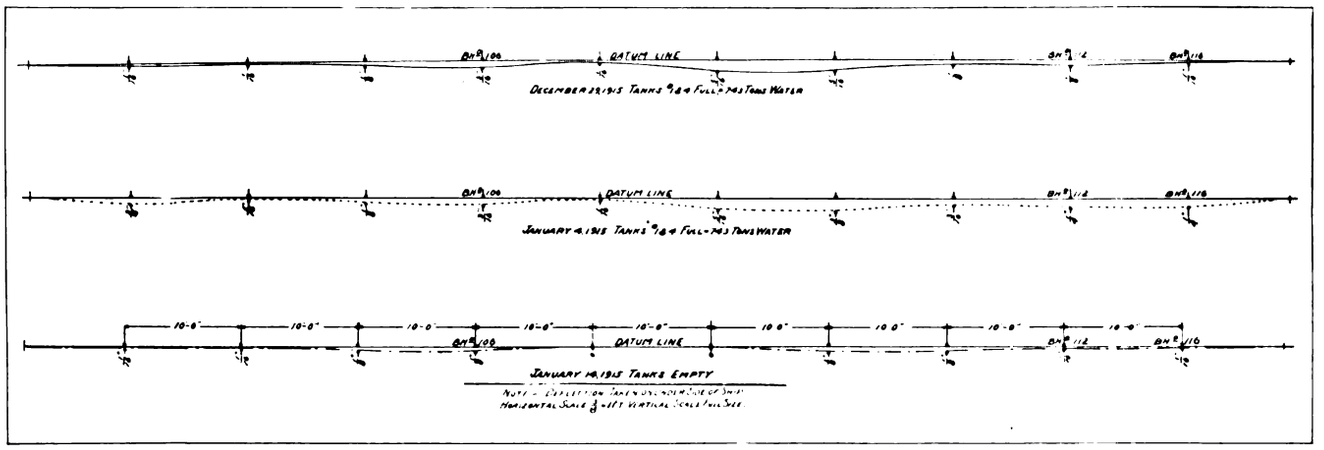
DATUM LINE
DECEMBER 29, 1914 TANKS 9 & 4 FULL-743 TONS WATER
DATUM LINE
JANUARY 4, 1915 TANKS 9 & 4 FULL-743 TONS WATER
DATUM LINE
JANUARY 14, 1915 TANKS EMPTY

Fig. 1—Curves Showing Deflection of Hull Under Hydrostatic Test

Hog and Sag of Merchant Vessels

Results of Interesting Tests Conducted on the Colliers Ulysses and Achilles Showing Settlement at Different Stages of Loading

By T. M. Cornbrooks

IN A PAPER read before this society in 1913, Naval Constructor S. F. Smith presented considerable data showing observations made on three navy colliers built by the Maryland Steel Co., to which was added the data of the two colliers built by the Newport News company. Since that time, two additional colliers have been constructed for the Panama canal. These colliers are of the same general dimensions as ORION and JASON, but of increased deadweight capacity.

ULYSSES and ACHILLES, Panama colliers Nos. 1 and 2, are built from the same lines as ORION and JASON, but to secure the necessary capacity for coal the machinery was moved aft 15 feet and the 'thwartship coal bunkers reduced 10 feet in length, making the holds 25 feet longer. The contract for these vessels required that they should carry 12,000 tons of cargo, 1,200 tons of bunkers and 105 tons of stores, feed water, crew and effects, on a draught of 28 feet 1 inch. As a matter of fact, they drew 27 feet 8 inches when loaded with the above deadweight.

Following the methods used in securing the data on the previous colliers, we started by establishing a datum line by transit while the vessels were on the stocks and supplemented this by readings taken immediately after launch, when machinery was installed, when in dock, before loading and when fully loaded. These curves are shown in Fig. 2. It will be noted that when fully loaded, ULYSSES sagged 2⅛ inches and ACHILLES 2⅞ inches from the original datum line, as compared with 3⅞ inches on NEPTUNE, 2⅛ inches on ORION and 3⅜ inches on NEREUS. The difference in the amount of sag between ORION and JASON and ULYSSES and ACHILLES probably can be accounted for by the better distribution of cargo. It will be noted that two curves are shown of ACHILLES, of the ship complete on May 10 and again on May 20. These observations were taken under the dates noted to determine the deflection while the forward oil tanks and double bottoms were filled with water as itemized, in preparing for a test of the oil pumping capacity.

The results show considerable hogging effect when compared with ULYSSES when completed on March 15, which can be accounted for by the different conditions of tank loadings.

In addition to the curves taken on ORION and JASON, observations on ACHILLES were taken, as shown by the curves in Fig. 1, for determining the deflection of the hull in way of the forward oil holds, when under hydrostatic test. No. 1 starboard and No. 4 port holds were filled with water to the second deck with the pipe column to the upper deck 8 feet above. Measurements were taken before, during and after tests at ten stations on the starboard side, spaced approximately 10 feet each, starting 10 feet forward of forward bulkhead No. 112 of hold No. 1 and extending 30 feet aft of after bulkhead No. 106 of hold No. 4, the distance between forward bulkhead of No. 1 hold and after bulkhead of No. 4 hold being 50 feet. With the exception of the three forward stations which were in the way of the planked-over portion of the building ways, a stake 3 inches square by 30 inches long was driven flush with the ground and a tack driven flush in the head of the stake and on the planking on the ways. A corresponding center punch mark was made on the hull above; the height at these points or stations was carefully measured with the results herein noted.

Provision for carrying the extra weight during the test was made by fitting, in the way of tested compartments, additional keel blocks adjacent to the regular ones and also additional shores between the regular shores. Extra cribbing was also provided under the bottom between keel blocks and bilge shores. The total bearing of keel blocks, shores and extra cribbing amounted to approximately 480 square feet. The weight of the ship for 50 feet at 12 tons per foot was estimated at 600 tons. The weight of water in No. 1 and No. 4 holds was estimated at 743 tons, this making a total of 1,343 tons, or a bearing pressure of 2.8 tons per square foot.

In checking the measurements during the test, with tanks filled, the following deflection was observed at the various stations, starting forward, under the dates noted:

	Dec. 29, 1914 inches	Jan. 4, 1915 inches
Station No. 1	1/16	1/4
Station No. 2	1/8	1/4
Station No. 3	1/8	5/16
Station No. 4	5/16	3/8
Station No. 5	5/16	5/16
Station No. 6	1/16	5/16
Station No. 7	3/16	3/16
Station No. 8	1/8	1/8
Station No. 9	1/16	1/16
Station No. 10	1/16	1/16

Check measurements were taken Jan. 14, 1915, at the various stations after tanks were emptied, which showed the

Presented at the twenty-third general meeting of the Society of Naval Architects and Marine Engineers, New York, Nov. 18-19, 1915.

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ship to have settled from the original measurements taken Dec. 21, 1914, before tanks were filled, as follows:

	Inches.
Station No. 1	1/8
Station No. 2	1/8
Station No. 3	1/8
Station No. 4	1/8
Station No. 5	0
Station No. 6	0
Station No. 7	1/8
Station No. 8	1/8
Station No. 9	1/8
Station No. 10	1/8

The difference in the above measurements can be accounted for by the variations in fitting packing, cribbing and shoring under the ship. It would be fair to assume that all the packing, cribbing and shores would not be wedged up or fitted uniformly to exactly the same reactive pressure and the ship when under test would naturally deflect the least where the reactive pressure was the greatest. This is evidenced by reference to the check measurements above, taken Jan. 14, 1915, showing no permanent settlement at stations No. 5 and No 6 and 1/8-inch settlement at station No. 7, which can be accounted for as explained above relative to the fitting of packing, etc. It was in way of stations 4, 5 and 6 that the extra cribbing was provided having a ground bearing area of 104 square feet. Allowance must also be made in a test of this character for initial settlement where a heavy load is applied.

In a discussion before the Institution of Naval Architects in London on March 24, 1915, Mr. French stated that some of the Great Lakes vessels were sagged as much as 10 inches, which would appear to be excessive.

Lake Erie Ore Receipts

Out of a total shipment of 4,445,129 tons of iron ore during November, 4,308,295 tons were received at Lake Erie ports, distributed as follows:

Port.	November, 1915.
Buffalo	600,879
Port Colborne	24,934
Erie	138,165
Conneaut	725,295
Ashtabula	1,066,031
Fairport	188,834
Cleveland	948,249
Lorain	301,030
Huron	60,833
Sandusky	.....
Toledo	201,745
Detroit	52,300
Total	4,308,295

Large Motor Ships

The newest motor ships are now being built to a length of over 400 feet, or very nearly as large as the White Star liner BRITANNIC, which was one of the first of the big transatlantic liners propelled by steam. One of the largest motor ships to be turned out is TONGKING, for the East Asiatic Co., and a sister to SIAM, MELAKKA and ANNAM. These vessels each have a length of 410 feet between perpendiculars, a breadth of 55 feet, and a depth molded of 30½ feet. The deadweight capacity is 9,700 tons. BRITANNIC, built in 1874, had a length of 455 feet and a displacement of 8,500 tons. TONGKING's engine installation consists of two six-cylinder motors developing 3,100 indicated horsepower.

All auxiliary machinery is driven by electricity and all pumps are independent of the main engine. During the trial trip of TONGKING a speed of 12.71 knots was obtained on a horsepower of 3,328. The oil consumption was 149 grammes of ordinary Borneo crude oil.

Soo Canal Report

The movement of freight through the canals at Sault Ste. Marie during the month of November aggregated 9,168,431 tons, compared with 4,044,368 tons moved during November, 1914. This makes a total of 69,109,885 tons of freight passing through the canal to Nov. 1, an increase of 14,291,837 tons over the corresponding period last year, when 54,818,048 tons were moved. The statement follows:

EAST BOUND.

	To Dec. 1, 1914.	To Dec. 1, 1915.
Copper, net tons	85,038	151,634
Grain, other than wheat, bushels	64,412,519	55,533,563
Bldg. stone, net tons	.....	.....
Flour, barrels	9,352,303	8,055,927
Iron ore, net tons	31,410,069	45,133,289
Pig iron, net tons	18,379	15,640
Lumber, M. ft. B. M.	446,238	451,795
Wheat, bushels	142,094,166	206,314,769
Gen. merch., net tons	239,871	308,753
Passengers, number	28,731	22,402

WEST BOUND.

Coal, anthracite, net tons	2,166,555	1,942,630
Coal, bituminous, net tons	12,191,716	11,092,594
Flour, barrels	662	100
Grain, bushels	.....	31,623
Mfctd. iron, net tons	218,758	177,712
Iron ore, net tons	3,696	1,500
Salt, barrels	751,618	671,596
Unclass. frght., net tons	1,048,818	1,237,179
Passengers, number	30,998	24,395

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons	39,076,250	54,557,241
West bound, net tons	15,741,798	14,552,644
Total	54,818,048	69,109,885
Vessel passages	18,420	20,594
Registered tonnage	41,638,849	54,928,244

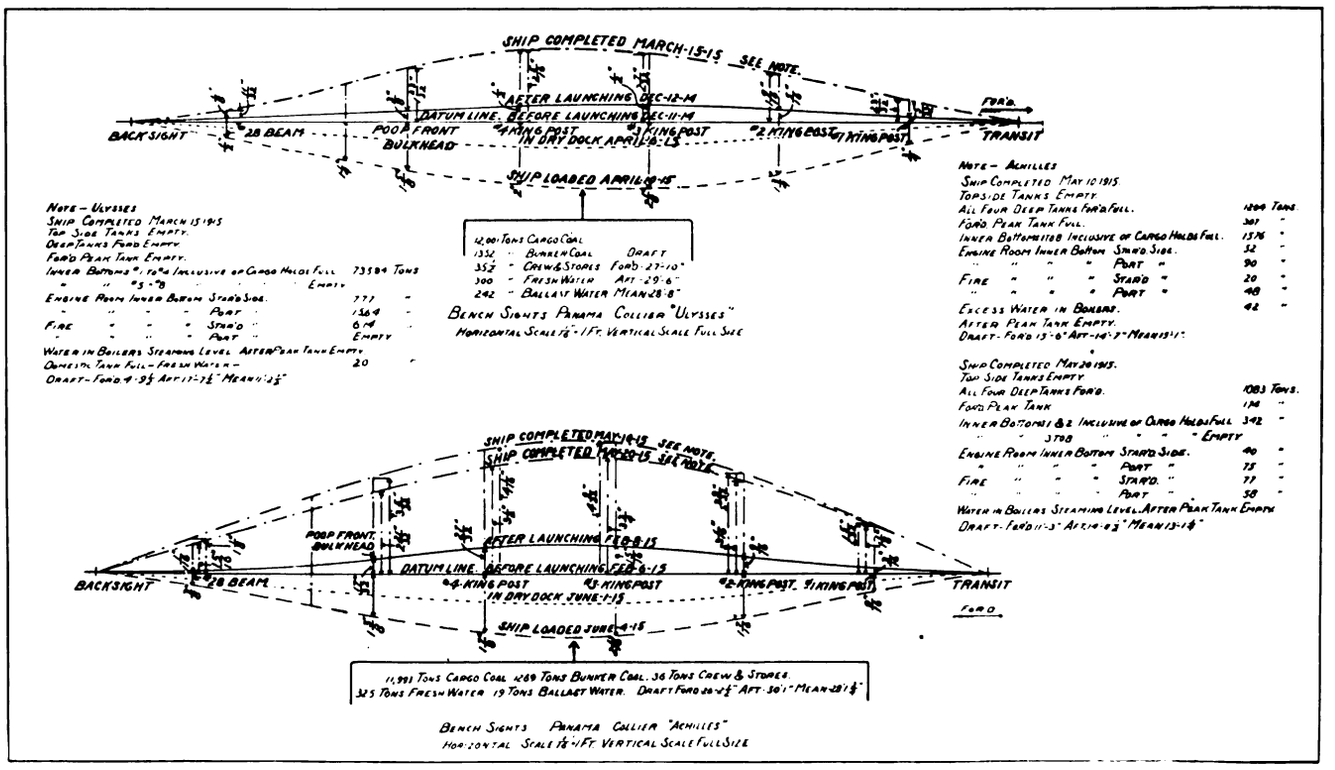
SHIP COMPLETED MARCH 15-15
SEE NOTE.
AFTER LAUNCHING DEC-12-14
DATUM LINE. BEFORE LAUNCHING DEC-11-14
BACK SIGHT
28 BEAM
POOP FRONT BULKHEAD
#4 KING POST
#3 KING POST
IN DRY DOCK APRIL 8-15
#2 KING POST
#1 KING POST
FORE'D
TRANSIT
SHIP LOADED APRIL 9-15
Note - Ulysses
Ship Completed March 15 1915
Top Side Tanks Empty.
Deep Tanks Fore & Aft Empty.
Fore'd Peak Tank Empty.
Inner Bottoms #1 to #4 Inclusive or Cargo Holds Full 7358 Tons
" " #5 - #8 " " Empty
Engine Room Inner Bottom Stard Side. 777 "
" " " " Port " 1564 "
Fire " " " Stard " 614 "
" " " " Port " Empty
Water in Boilers Steaming Level. After Peak Tank Empty
Donkey Tank Full - Fresh Water - 20 "
Draft - Fore'd 4'-9½" Aft 17-7½" Mean 11'-2½"
12,001 Tons Cargo Coal
1352 " Bunker Coal Draft
352 " Crew & Stores Fore'd 27'-10"
300 " Fresh Water Aft 29'-6"
242 " Ballast Water Mean 28'-8"
Bench Sights Panama Collier "Ulysses"
Horizontal Scale 1/8" = 1 Ft. Vertical Scale Full Size
Note - Achilles
Ship Completed May 10 1915.
Top Side Tanks Empty.
All Four Deep Tanks Fore & Full. 1200 Tons.
Fore'd Peak Tank Full. 301 "
Inner Bottoms #1 to #8 Inclusive or Cargo Holds Full. 1576 "
Engine Room Inner Bottom Stard Side. 52 "
" " " " Port " 90 "
Fire " " " Stard " 20 "
" " " " Port " 48 "
Excess Water in Boilers. 42 "
After Peak Tank Empty.
Draft - Fore'd 13'-6" Aft 14'-7" Mean 13'-11"
Ship Completed May 26 1915.
Top Side Tanks Empty.
All Four Deep Tanks Fore'd. 1083 Tons.
Fore'd Peak Tank 114 "
Inner Bottoms #1 & #2 Inclusive or Cargo Holds Full 342 "
" " 3798 " " " Empty
Engine Room Inner Bottom Stard Side. 40 "
" " " " Port " 75 "
Fire " " " Stard " 77 "
" " " " Port " 58 "
Water in Boilers Steaming Level. After Peak Tank Empty
Draft - Fore'd 11'-3" Aft 14'-6½" Mean 13'-1½"
SHIP COMPLETED MAY 14-15
SEE NOTE.
SHIP COMPLETED MAY 26-15
POOP FRONT BULKHEAD
AFTER LAUNCHING FEB 6-15
DATUM LINE. BEFORE LAUNCHING FEB 6-15
BACK SIGHT
28 BEAM
#4 KING POST
#3 KING POST
IN DRY DOCK JUNE 1-15
#2 KING POST
#1 KING POST
TRANSIT
FORE'D
SHIP LOADED JUNE 4-15
11,991 Tons Cargo Coal 1269 Tons Bunker Coal. 36 Tons Crew & Stores.
325 Tons Fresh Water 19 Tons Ballast Water. Draft Fore'd 26'-4½" Aft 30'-1" Mean 28'-1½"
Bench Sights Panama Collier "Achilles"
Horizontal Scale 1/8" = 1 Ft. Vertical Scale Full Size

FIG 2—CURVES SHOWING SAG OF COLLIERS ULYSSES AND ACHILLES

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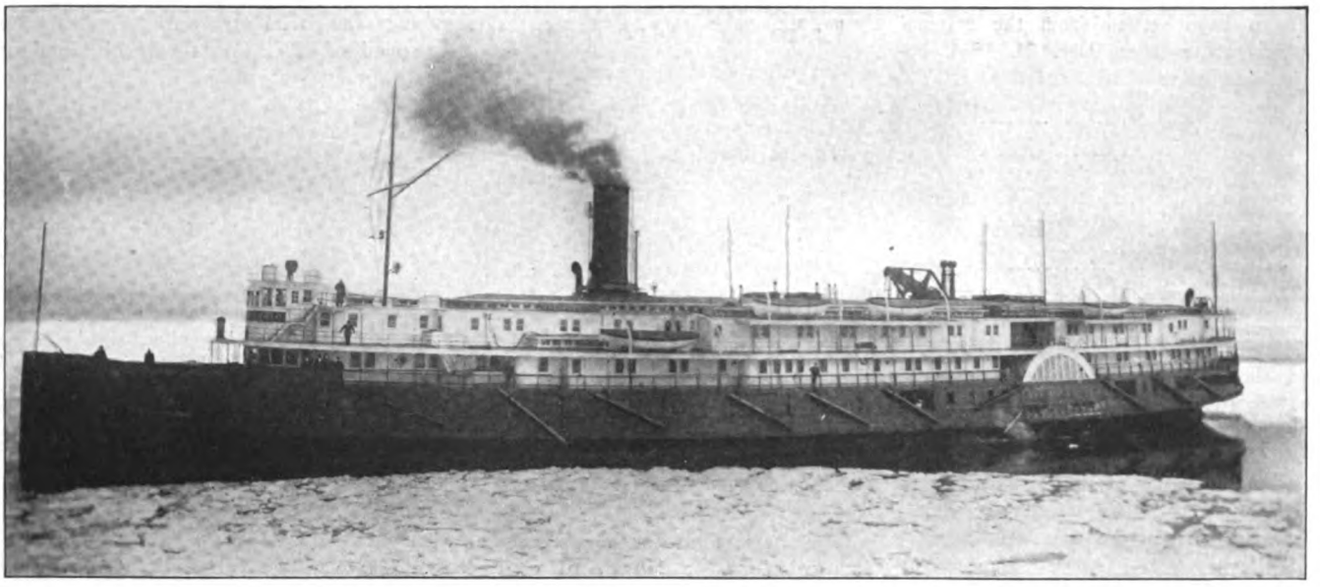
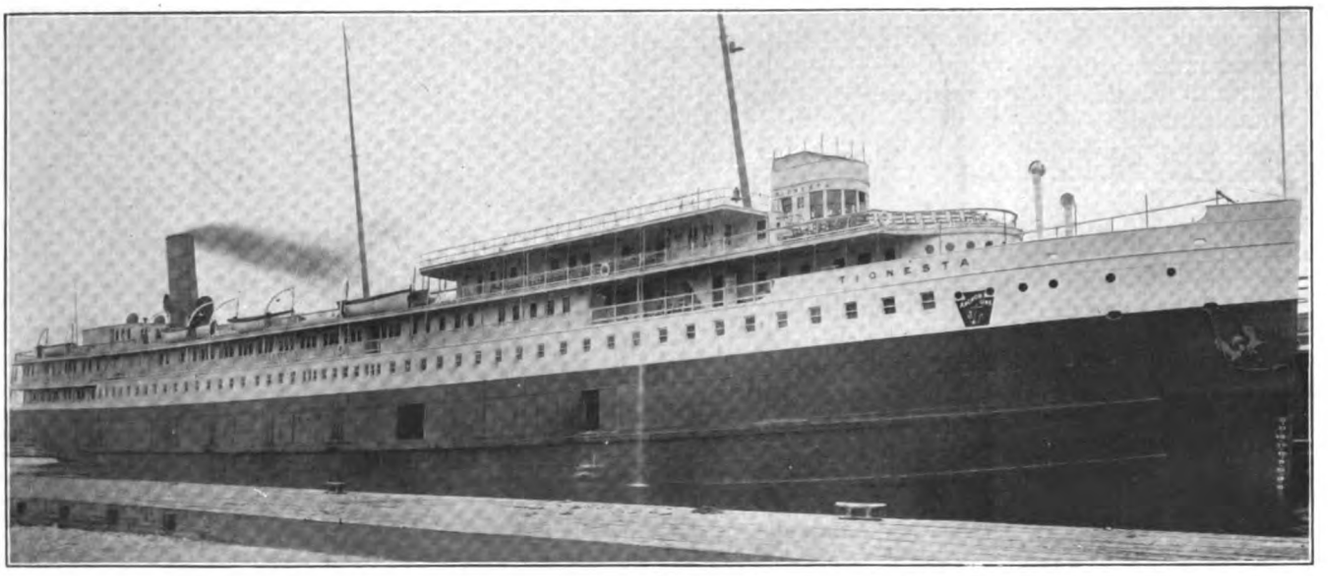


City of Buffalo—Representative Type of Great Lakes Passenger Steamer

More Ring Buoys Than Sailors

SOME of the inconsistencies of the LaFollette seamen's act have been strikingly revealed since it became operative early in November. These vagaries have proved a source of trouble not only to the government officials charged with enforcing the law, but more particularly to the vessel owners who must bear a heavy loss in meeting some of its requirements. Under the requirements of section 14, all boats under 400 feet in length are required to carry 12 ring buoys, at least six of which must be luminous. The accompanying illustrations show how this regulation works out. TIONESTA and CITY OF BUFFALO are typical Great Lakes passenger and freight carrying vessels. Both are under 400 feet in length. CITY OF BUFFALO, during the summer season frequently carries 600 passengers. The tug ALICE STAFFORD, operated by the Erie railroad in Chicago harbor, must carry the same number of ring buoys as the two larger vessels illustrated. Operating within the 3-mile limit, the tug is required to carry four men, but when she is running on the 14-mile trip to South Chicago she must be crewed with nine men. The tug carries more ring buoys than there are men on board. ALICE STAFFORD also carries a 12-person life boat, a six-person life raft and 12 life jackets.

ERIE RAILROAD TUG ALICE STAFFORD



BIG STEEL STEAMER TIONESTA OF THE ANCHOR LINE

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Gyro-Stabilizing a Cruiser Yacht

Remarkable Results Attained With Small Active Type Installation on Board Great Lakes Pleasure Craft—Rolling Practically Eliminated

By Elmer A. Sperry

OWING to the desire on the part of the officers of the navy to obtain reliable data at first hand a number of noteworthy experiments on board the U. S. S. WORDEN with the active type of gyro-stabilizer were undertaken. The gyros were fitted to her main deck solely for experimental purposes and in order to obtain data and records having an important bearing on the question of stabilization. The observations thus made were quite diversified, as they included the stabilizer plant proper, all the features of automatic precession control, methods of producing artificial precession of the gyros, and also observations on the ship itself under conditions of stabilization as to motion and behavior and also the effect upon the structure. As a result of this work, it has been established that the gyroscope is useful in solving certain problems at sea, and orders have been issued for fitting permanent plants, thus putting it into practical service.

Since this work further investigations have been in progress. Among these have been determinations of the exact amount of the true wave increment the gyros are required to neutralize, involving the relation of the gyro-quenching increment to the natural extension curve of roll of the ship. A number of experiments have also been undertaken to determine the relation of ship to gyro. It is gratifying to note that all of this work has proved the soundness of the basic formula originally laid down by Naval Constructor Taylor, now chief of the bureau of construction and repair of the United States navy, in the course of which he points out that the gyro moment of stabilizer equipment for ships varies directly as the characteristic of the ship; that is, as the product of the displacement, the metacentric height and period of roll. No variation from this rule is involved in the fact that it has been definitely ascertained that small boats require relatively larger moments or greater stabilizing power than is the case with larger ships. This means that waves of given magnitude belabor small ships more than they do large ones, which is to be expected. The former therefore require relatively more roll quenching power. Again, it is possible to adjust the plant in other ways to meet special conditions such, for instance, as limited space, met with in the case of submarines; limited weight, which is the case where the gyro is placed on deck, as in the motor yacht WIDGEON, and which is also the case with submarines; then again the condition where a limited power supply is available for spinning the gyro or gyros and handling the equipment. Inasmuch as the roll quenching power of the gyroscope varies as the square of its diameter and only directly as its speed and weight, and inasmuch as another factor, the power required for spin at the higher rates, varies almost directly as the cube of the peripheral velocity, it will at once be seen that where ample space is available and the matter of weight is not critical, the rotor and spread of bearings may be so adjusted as to require a minimum of power for maintaining the spin of the wheel for a maximum of gyroscopic moment. On the contrary, where only a limited space and weight are permissible, and an abundance of power is available, a small gyro, spinning at higher velocity, may be utilized for developing comparatively large stabilizing moments.

The first commercial gyroscope stabilizing equipment to be installed has been placed upon the beautiful little yacht WIDGEON, plying on the Great Lakes, and owned by H. M. Hanna Jr., Cleveland. This was placed in service in the autumn of 1915, and is of the full active type. The characteristics of WIDGEON, after some investigation, were determined to be as follows:

Displacement	165 tons
Metacentric height	1.75 ft.
Period of roll, over and back	4.75 sec.
Water line length	120 ft.
Water line beam	18 ft., 2 inches
Total submerged amidship section	80 sq. ft.

For this ship a gyro was selected, the rotor, shaft and armature weighing 2,150 pounds. The space selected as most suitable under all conditions for the location of the plant was on deck just abaft the stack, where it has been surrounded by a cabinlike housing provided with windows permitting full observation of all of the movements and oscillations of the gyro, which are known to be more or less unusual and interesting in character. The total weight of the equipment is about 1 per cent of the displacement.

This yacht was considered a very free roller and has been reported to have rolled through an arc of 70 degrees or thereabouts. The gyroscopic roll recorder shown in Fig. 9, afterwards em-

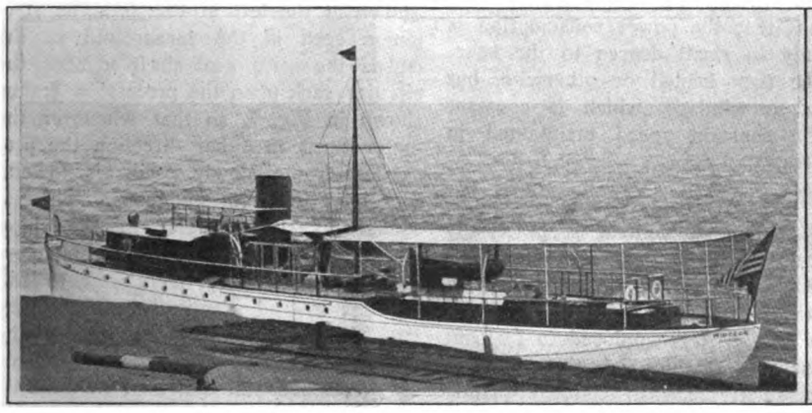

FIG. 1—CRUISER YACHT WIDGEON, SHOWING GYRO-STABILIZER AND INCOMPLETE HOUSING

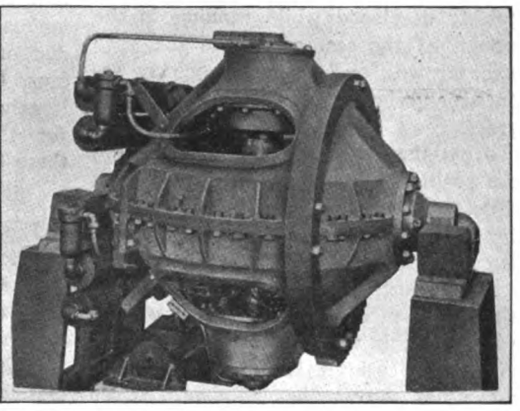

FIG. 2—GYRO-STABILIZER USED IN WIDGEON

A paper read at the twenty-third general meeting of the Society of Naval Architects, New York.

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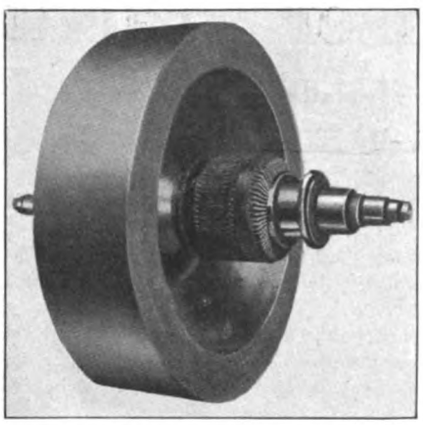

FIG. 3—WHEEL AND ARMATURE OF GYRO

ployed in this ship, showed, however, that the estimate of roll from the ship's clinometer may have exaggerated this arc to some extent. After installation it was found that when the gyro was thrown "off," a free roll of from 24 degrees to 40 degrees of total arc was quickly developed while running in the trough of the sea, and when the gyro was thrown "on," this was quickly reduced and held at 2 degrees or 3 degrees.

From the characteristics of WIDGEON, the position selected and the fact that a little gasoline-electric generator installed for the purpose was available for driving the gyro, a wheel of 3 feet diameter by 10-inch face was adopted as the size best suited to the conditions. This wheel is run at very low fibre stress, giving a very large factor of safety, the maximum stress being about 12,000 pounds. The current supply being direct current, a direct current motor was constructed practically as a part of the rotor shaft, as shown in Fig. 3.

It is interesting to note how small a motor is really required to maintain such a wheel as this at a speed of about 2,750 revolutions per minute, this motor having run the wheel repeatedly to 3,500 for over-stressing and test purposes. The motor is in excess of the actual spinning requirements by fully 300 per cent for quickly energizing the rotor mass in getting it up to speed. At the ends of the shaft are located the main bearings, which, though specially made, are of the ordinary annular ball type, ample provision being made for taking care of the end thrust. In each end of the casing are oil wells and a little slowly rotating oil pump which circulates the oil upwardly through the coolers, a strainer seen in Fig. 2, and back over the top of the bearings, thus insuring both ample lubrication and cooling of the bearings. The temperature difference between the incoming and outgoing oil is just noticeable when the gyro is doing full duty in heavy weather, this temperature practically equalizing when the gyro is not precessing.

It is also extremely interesting to note that while the radial load on these bearings varies between practically zero and about six tons, the power varies only slightly, one observation showing a change of from only 35 to 40 amperes between these two conditions. This indicates that the power consumption is due only in small degree to the bearings, be they loaded or otherwise, but largely to windage, which is constant for the constant speed maintained in these tests.

Use Auxiliary Gyroscope

The system of control is practically identical with that which was finally adopted in the last experiments on WORDEN. A small auxiliary gyro, shown in Fig. 5, is employed to feel out the incipient rolling of the ship by closing small electrical contacts plainly to be seen, as soon as the ship rolls very slightly one way or the other. These contacts are required to handle only a very few watts, in fact about one-quarter of the energy of an ordinary incandescent lamp, and through a relay switch serve to actuate a small reversing motor which constitutes the precession motor shown in Fig. 6. This motor precesses the gyro upon its main supporting gudgeons at the ends of the frame; it is here that the gyro lays hold upon the ship to control its move-

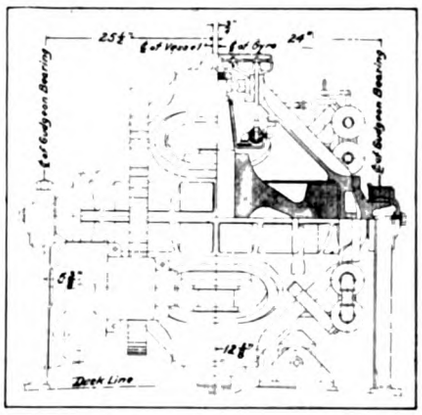

FIG. 4—ELEVATION OF GYRO PLANT

ments. The motion of the precession motor is transmitted through a centrally located flexible coupling, on the periphery of which is seen the solenoid-controlled brake, which always goes "on" when the motor is "off," and vice versa. The coupling drives a worm engaging a worm gear within the oil-tight housing, shown at the left in Fig. 6. The steel pinion seen in the foreground at the end of the worm gear shaft engages the circular rack upon the precession frame, shown in Fig. 7, so that whenever the motor turns in either direction the precession frame slowly oscillates to and fro upon its main gudgeons. The response to slight angles in the ship's motion is found to be very complete—one person walking from rail to rail actuates it—and practically without time lag. With each of these tilts of the gyro very heavy gyroscopic moments are developed and delivered to the ship simultaneously with and in opposition to each wave increment from the sea; these opposite forces cancel each other. While this contest of forces goes forward, the ship, with its ponderous mass, which always requires time to take on motion, stands aloof and does not move one way or the other until one of these forces conquers. The gyro is always victorious, and the ship is thus actually given an incipient roll in the *opposite direction*, the contact of the little controlling gyro which initiated all of these

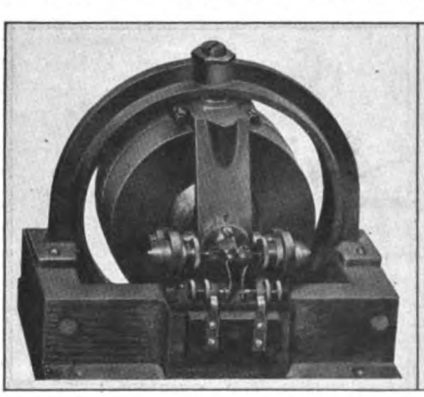

FIG. 5—AUXILIARY GYRO

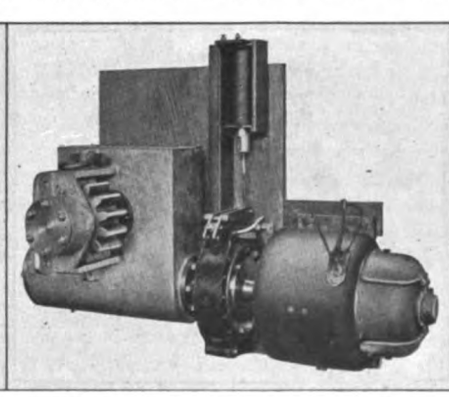

FIG. 6—REVERSING PRECESSION MOTOR

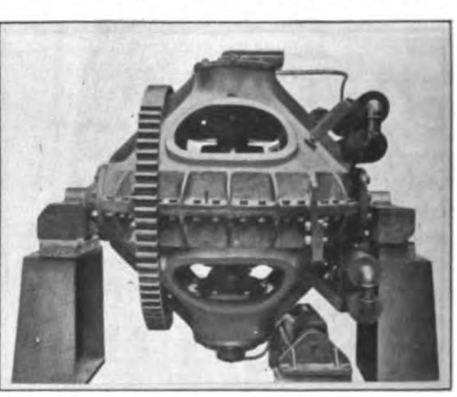

FIG. 7—GYRO SHOWING CIRCULAR RACK ON PRECESSION FRAME

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movements being finally broken. The precession motor then stops, the brake is applied and the generation of heavy opposing gyro moments in that particular direction is brought to an end. The gyroscope itself is thus free and stands ready to neutralize and quench the next wave increment or rolling increment which usually arrives from the opposite side of the ship, whereupon the above cycle of operations causes the gyro to automatically oscillate oppositely and effectually prevents any roll beginning in the opposite direction. Inasmuch as all rolling of ships is due to an accumulation of individual wave increments, and since each increment is checked and neutralized, as we have seen, the ship never starts to roll and therefore never rolls.

Operation Simple and Noiseless

The plant works very smoothly and practically without noise, and seems to perform its duty easily. A little reversing switch, provided with nameplates plainly marked "Rolling" and "Stabilizing," allows the stabilizer to be operated to roll the boat at will. This is useful in working off from sand bars, mud banks, negotiating ice packs, etc. In fact this has already been found extremely serviceable in the shallow waters of Toledo inlet.

Other points that have been definitely settled by the operation of the stabilizer are as follows:

That under conditions of a strong wind which had been blowing all day, with government storm warnings hoisted all along Lake Erie, a trip was made from Toledo to Cleveland, in the evening, where with the gyroscope "off" the ship rolled up to 25 degrees each side of the vertical. With the gyroscope "on," this roll was quenched down to an average of 3 degrees or less, the interesting point being that the boat steered very much steadier and made her run in as good time as on any previous trip, including calm seas. While being stabilized her decks remained dry. The

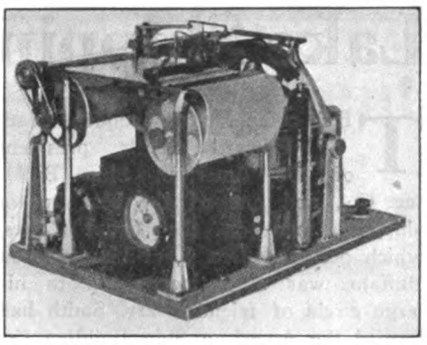

FIG. 9—RECORDING APPARATUS

gyro being mounted right over the main saloon, it was feared that the deck would operate as a sounding board and that the noise would be objectionable. This, however, was not found to be the case. While one is conscious of some noise, especially in choppy and uneven seas, there seems to be no difficulty in carrying on an ordinary conversation. There is no noise whatever in any of the staterooms aft. The chief engineer and others who reviewed the operation of the plant declare themselves satisfied that it is "thoroughly practicable and that there will be no difficulty in keeping it in proper operating condition." Fig. 4 shows an elevation, partly in section, of the plant, with a few rough dimensions.

Secure Graphic Records

Thorugh the courtesy of the owner of the yacht automatic records of the performance of the plant have been made, extending over a number of sea trials, including also some rolling records, all of which are available for the use of the department. The gyroscopic recorder employed to make these records is shown in Fig. 9. An attachment was made to the gyro plant so that a pen upon the tape might indicate the characteristic precession movements of the gyro during stabilization. The resultant chart clearly shows the different magnitudes of the precession movements of the gyro, as they automatically adjust themselves to the neutralization of widely different wave increments applying forces from the sea to either side of the ship. Some of these wave increments require a full precessional oscillation, others requiring only a very trifling precessional oscillation. Instances are also seen where successive wave increments come in from the same side of the ship, requiring a second oscillation in the same direction for their quenching.

This diagram also shows how the forces of the sea, arriving first on one side of the ship and then on the other, are transmitted through the structure of the ship to the gyro equipment in the form of static forces, causing very great disturbances and activities of the gyro equipment, while the ship, through which these forces are transmitted, stands practically quiescent and free from motion other than the incipient rolls necessary to actuate the little control contacts.

Imparts Slight Oscillatory Motion

Records taken while the stabilizer was rolling the boat, with the gyro wheel spinning only 1,100 revolutions per minute, indicate that the gyro, running at this speed was enabled to impart to the yacht only a trifle over a degree per cycle of the oscillations of the gyro, and this only in the middle of the roll; an amplitude being quickly reached beyond which the precession motor was unable to oscillate the gyro at sufficient amplitude to increase the rolling of the ship. At this point a balance is struck, the energization of the ship from the gyro just equaling the natural friction increment of the yacht for this amplitude. The back reaction of the movement of the ship gradually cutting down the oscillating amplitude of the gyro against the precession motor is also clearly indicated.

In stabilizing a ship with the active type of gyro, no effort is made to hold the ship exactly vertical. On the contrary, the ship has full freedom in point of list, due either to distribution of load

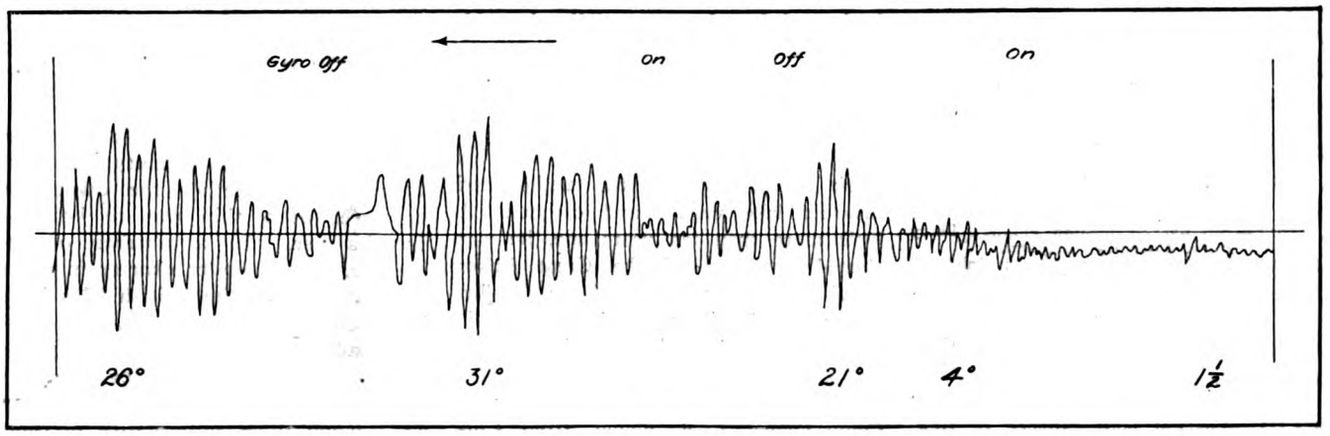

FIG. 8—GRAPHIC CHART OF GRYO OPERATION IN TROUGH OF SEA

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or wind or both. That is, the stabilizer holds the ship from motion, allowing it to take up any natural central position it chooses and to change this position from time to time, as conditions alter. In one case the ship was turned back and forth with reference to the wind, so as to emphasize the independence of the wind list. This was shown by the wandering line drawn through the center of the oscillations in the chart.

Fig. 8 shows rolling records while going in the trough of the sea with gyro "on" and "off" in medium wind. The maximum amplitude is marked at several points on the chart, together with the points where the gyro was thrown "on" and "off."

The records show that the rolling of the ship is always due to an accumulation of individual wave increments. These are seen to increase quite uniformly from the right to the left when the gyro is thrown "off."

The thanks of the author are due to the many courtesies received from the owner of this yacht, M. H. Hanna Jr., and his officers and crew.

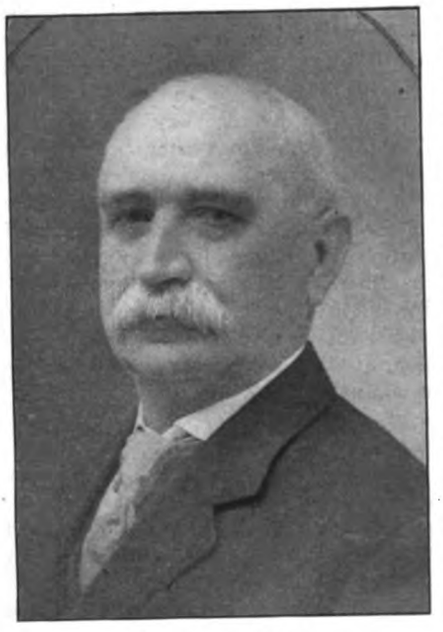
Recent Marine Patents

Copies of any one of the following patents can be obtained by sending 15 cents in stamps to Siggers & Siggers, patent lawyers, Suite 11, National Union building, Washington, D. C., if THE MARINE REVIEW is mentioned.

1,145,884.—Ship's indicator; Edwin A. Fish, New London, Conn.
1,146,059.—Collapsible life-boat; Hugo Ernst, Camden, N. J.
1,146,121.—Propeller; Theodore Amnelius, So. Framingham, Mass.
1,146,229.—Means for protecting shores and directing the flow of water-courses; John W. Adamson, Fullerton, Neb.
1,146,365.—Internal combustion engine; Benjamin F. Stewart, Chicago.
1,146,435.—Internal combustion engine; Walter J. McVicker, Minneapolis.
1,146,440.—Internal combustion or explosion engine; Konrad Nicoll, Milwaukee.
1,146,630.—Internal combustion motor; Elmer C. Long, Hannibal, Mo.
1,146,781.—Submarine armor; Harry L. Bowdoin, Bayonne, N. J.
1,146,841.—Oar; Mack M. Bridges, Chicora, Miss.
1,146,958.—Breakwater shield for submarine boats; Richard H. M. Robinson, Bridgeport, Conn.
1,147,070.—Boat clamp screw; Charles Bennett, Cleveland.
1,147,083.—Propeller; Walter I. Gibson, Washington, D. C.
1,147,158.—Life boat; Frederick Fox, Oakland, Cal.
1,147,233.—Propeller; Arthur Hugo Cecil Gibson, New York.
1,147,313.—Internal combustion engine; Frank Desort, Cleveland.
1,147,370.—Internal combustion engine; Conradin Alfred Breitung, Seattle, Wash.
1,147,658.—Motor; John M. Stukes, San Antonio, Tex.
1,147,966.—Collapsible life boat; John Robertson Munn and George MacLaren, Glasgow, Scotland.
1,148,052.—Internal combustion engine; Percy Riley, Coventry, England.
1,148,103.—Mine raising apparatus; John C. Lorato, Lowell, Mass.
1,148,118.—Internal combustion engine; Richard T. Newton, Nutley, and Inglis M. Uppercu, Newark, N. J.
1,148,286.—Internal combustion engine; Chas. F. Buschke, Milwaukee.
1,148,380.—Navigator's course marker and finder; Edward Yound Haskell, New London, Conn.
1,148,382.—Bulkhead hoist; Homer L. Hawkins, Santa Barbara, Cal.
1,148,434.—Propeller; Henry L. Benedict, New York.

Lake Shipping Leader Dies

THE comparatively sudden death of Edward Smith, president of the American Ship Building Co., and one of the best known shipping men on the Great Lakes, which occurred Dec. 5, at his home in Buffalo, was a distinct shock to his large circle of friends. Mr. Smith had headed the American Ship Building Co. for a little more than a year, having previously been identified, among many important interests, with the Great Lakes Towing Co., as its president. Taken ill in Cleveland two weeks ago, he at once returned to his home, where he succumbed to acute heart disease.



EDWARD SMITH

Mr. Smith was the son of a German revolutionist, one of the famous Forty-eighters, who also died recently, almost a centenarian. He was born in Germany 70 years ago. His first position was with the Bennett Elevator Co. After several years in a marine supply business, he became affiliated with Brown & Co., vessel agents, as managing partner, remaining with this firm from 1884 until 1904. During this time Mr. Smith performed an important service to the shipping industry by his work in systematizing the methods of insuring lake vessels and cargoes. A little more than ten years ago, he was elected president of the Great Lakes Towing Co., succeeding Harry Coulby. The rapid development of that firm is largely credited to his untiring efforts and great ability. Mr. Smith was also one of the founders of the famous Counselman's Line, plying from Chicago to Transatlantic ports, with four vessels, during 1901. In September, 1914, he was chosen president of the American Ship Building Co., resigning as head of the Great Lakes Towing Co. His time was about equally divided between Cleveland and Buffalo. The greater portion of Mr. Smith's extensive holdings in lake steamship lines was sold during recent years and, in fact, it is said that he had disposed of practically all such stock at the time of his death.

Few men on the Great Lakes have been privileged to enjoy the personal friendship of so large and representative a circle of leaders in marine and financial affairs as Mr. Smith. His personality combined great executive power and decisiveness with a warm and sincere humanity. Not only employers, but the representatives of labor itself, were invariably satisfied, and justly so, with his decisions in matters of difference. He was regarded as an authority on affairs pertaining to marine insurance and many stories are told of his being consulted on such questions in preference to specialists in this line. Though not possessed of technical training as regards the design of ships, he had amassed a store of practical knowledge which was of great service in numerous instances. The late executive was also the possessor of a ready and kindly humor which endeared him to his friends. He leaves a widow and three sons, Edward N., Harry B. and Eugene L. Smith, all of Buffalo.

Charterer to Get Money

In cases where the British Admiralty requisitions a vessel while under charter, the money paid by the government for such use goes to the charterer, and not to the owners of the vessel, according to a decision recently handed down by an English court. The ruling also declares that when the government is through with the vessel, it is to be turned over to the charterer.

Ever since the British government began taking over vessels for war purposes, much uncertainty has prevailed as to whether the owner or charterer of a ship was to be paid for its use. In a number of instances, vessels under charter in ports far distant from the British isles have been requisitioned by cable, and question had arisen as to which party the compensation was due. Several cases involving this point have been hung up, pending some authoritative decision by an English court.

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What the Government is Doing

Rulings on Marine Matters **Improvements to Waterways**

Hints to Navigators

Protection for American Vessels

CRITICISMS of the protection being given to American vessels on the high seas have been constant ever since the outbreak of war in Europe. In many cases, investigation has established the fact that these criticisms are unwarranted. One of the more recent instances has arisen in connection with the operation of those vessels belonging to the American Trans-Atlantic Co., of which Richard Wagner, of New York, is president. One of Mr. Wagner's ships, HOCKING, has been taken by the British and is now detained at Halifax. The ship will be taken to England and will go before the prize court on the point of the good faith of its transfer or ownership. Mr. Wagner has asked the state department whether it would not be possible to obtain an expression of opinion as to the extent to which the United States government intends to defend his rights and whether the United States will afford him protection for the other vessels comprising his fleet.

Question of Ownership

It is understood that the state department so far has not given Mr. Wagner an answer because there is no intention on the part of the United States to question the authority of England to inquire into the bona fides of the ownership or transfer of a vessel which has changed ownership after the outbreak of the war. It appears from the record available that the bureau of navigation of the department of commerce refused for a time to grant American registry to the Wagner ships because it was believed that the majority ownership of these vessels was German. The state department ruled that actual ownership was not a consideration upon which registry could be refused. In view of this, it is believed, there is no reason why the United States should protest vigorously the seizure of HOCKING. The state department has promised to grant Mr. Wagner the full protection of his rights, however, and for this reason the case before the British prize court will be followed with due care.

The basis for criticism is due to a defect in the American law. When the emergency ship registry act was passed in congress it was proposed to have it provide that a vessel to obtain American registry should be owned by American citizens or by an American corporation, the majority of whose stock was owned by American citizens. This provision was stricken from the bill while under consideration, and when it was enacted into law it merely provided that if owned by a corporation, the corporation should have American citizens for officers and should have American directors and managers.

It has therefore been made possible for a German ship owner, should he so desire, to have an American corporation organized by a friend in the United States and to turn his ships over to this corporation. His American friend may hold the ownership of the corporation in his own family and appoint the officers and managers. The technical ownership of the vessels would then be American and, under the law, American registry could be demanded and obtained, but the actual ownership would still be German and fit prizes of war under international law. Even should the bona fides of the ownership be questioned there remains the question of transfer after the beginning of war.

France has already seized and condemned DACIA because she was purchased from her German owners after the outbreak of the war. That was a test case which has already been decided. It is believed by officials at Washington that England has a right to examine into the status of HOCKING upon the same grounds. The question of principle is involved. If the United States should deny this right to England we would in turn be denied a similar right should war be made upon the United States at some future time.

"By granting American registry to a vessel," states a high official of the state department, "we do not guarantee the bona fides of the ownership. Such is impossible under existing statutes."

Inadequate Protection

The soundest criticism of the lack of protection to American shipping interests has been based upon the attempts at legislation. Not only is the emergency ship registry act at fault, but the La Follette seaman's act and similar navigation laws are chiefly to blame. By enacting such laws as these, it is declared by shipping interests, the administration has shown the least disposition to grant adequate protection to the American merchant marine. Furthermore, by proposing to put the government into the ship-

Stand Approved

The strong stand taken in the October issue of The Marine Review against the practice of the government in taking an unfair advantage of the private ship yards in permitting navy yards to compete with them, has attracted considerable attention. The practice of omitting such items as interest on investment, overhead, depreciation, etc., pursued by the navy yards, is manifestly unfair to private ship builders and The Marine Review has repeatedly drawn attention to this practice. From a number of communications approving our stand on this matter we quote the following from the Anderson Steamboat Co., Seattle:

"We heartily concur with the views expressed on the position of the government yards competing with private yards. The stand taken by The Marine Review on this subject is worthy of every commendation and deserves the support of every private yard in the country."

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ping business in competition with private capital, the administration promises to jeopardize the best interests of the American merchant marine.

Senator Weeks, of Massachusetts, expressed the situation recently in a very pertinent summary, as follows:

"We should (1) repeal any legislation which, like portions of the seamen's act, militates against the development of the American merchant marine; (2) we should follow the practice of all other nations, which has resulted in the development of shipping, by giving sufficient aid to overcome the difference in cost which stands as a handicap against us; (3) such aid should only apply in cases where the operations cannot be conducted profitably, and only continue as long as conditions prevail, such aid being based on the service performed in carrying mails and furnishing ships for auxiliary purposes; (4) any governmental operations which place government-owned and controlled ships in competition with privately-owned and operated ships should not be countenanced. The judgment and experience of experts of all kinds on this subject should be sufficient to deter our taking such a hopelessly fatal step."

While all shipping interests may not agree to every suggestion made by Mr. Weeks, the general idea is accepted without question. By enacting radical legislation the United States is putting obstacles in the way of building up an American merchant marine.

To Examine Lifeboat Men

In a recent circular, the department of commerce designates "Deck officers of the vessels of the lighthouse service, coast and geodetic survey, and fisheries service" to examine applicants for certificates as life-boat men in accordance with the provisions of the seamen's act.

Assistants, aids, and other officers of the coast and geodetic survey, who stand a bridge watch, may be designated by commanding officers, or by inspectors, as examining officers, and shall be considered "deck officers" within the meaning of the above circular.

The examination shall be a reasonable demonstration to prove to the satisfaction of the examining officer that the applicant has been trained in all operations connected with launching of lifeboats and the use of oars; that he is acquainted with the practical handling of the boats themselves; and, further, that he is capable of understanding and answering the orders relative to lifeboat service.

New Export Regulations

NEW federal regulations governing the procedure in handling exports become effective Feb. 1, 1916. They have aroused such intense interest among manufacturers and shippers, that the bureau of foreign and domestic commerce, department of commerce, has reprinted the new order with explanatory text. This pamphlet is just off the press and is being supplied free of charge to those interested, upon application to the bureau. All shipments for export to foreign countries or to Alaska, Hawaii and Porto Rico, will be affected by the new regulations.

Accuracy of statement and completeness of description in export statistics are the primary objects sought by the new procedure. The data previously received by the bureau of foreign and domestic commerce, have frequently been lacking in these respects, largely by reason of the fact that interior shippers consign to their agents at the seaboard for export, goods unaccompanied by adequate descriptions for use in making export declarations. The new regulations seek to remedy this defect.

The importance of detailed and accurate returns as a basis for the statistical information published by the bureau of foreign and domestic commerce, is apparent when it is realized that the export trade of this country now exceeds $3,000,000,000 annually and is rapidly increasing. With practically all commodities participating in that growth, interests in commercial procedure is widespread. To meet the demand for authoritative instructions regarding the new requirements in export trade, the main features of the regulations on that subject are summarized as follows:

1.—A simplified form of shippers' export declaration has been prescribed, alike for exports by rail and by vessel. It is so drawn up as to prevent the disclosure of the value of goods to persons outside the customs service. The duplicate to be handed over to the shipper's agent at the seaboard or to the common carrier as proof of compliance with customs requirements, will contain no statement of value.

2.—The oath to shippers' declarations for export by water may be taken before any person authorized to administer oaths and not as heretofore exclusively before the collector of customs at the port of exportation. This will facilitate the preparation of export declarations by the original shipper instead of by his agent at the seaboard who is less cognizant of the character and value of the merchandise and the country of final destination. Manufacturers themselves are urged to make out the export declarations wherever practicable, to assist which work the bureau of foreign and domestic commerce cheerfully supplies to those interests the schedule containing the official classification of all merchandise entering export trade.

3.—The requirements on the part of common carriers have been somewhat simplified and hereafter copies of the way-bills will be accepted from the railroad companies in lieu of car manifests. In vessel manifests, a notation that the values are as stated on the shippers' declarations will be accepted in lieu of a detailed statement of the value of each shipment.

4.—On and after Feb. 1, 1916, the legal requirement that goods shall not pass out of the jurisdiction of the United States until shippers' declarations are presented in due form will be strictly enforced. Exception will be made only when the carrier gives bond to produce within 15 days export declarations (originals or duplicates) for all shipments.

Compliance with the new regulations, it is believed by government officials, will impose no hardships on exporters who have been observing the legal requirements. On the contrary, their convenience is served, and the co-operation of shippers generally will aid the bureau of foreign and domestic commerce in publishing full and accurate information regarding the export trade and thus furnish to the manufacturers of the country an accurate business guide.

Become Largest Private Ship Owners

Alfred Holt & Co have acquired from T. B. Roydon & Co. the fleet of Indra liners, seven in number, which run between New York and the Far East. Both companies are owned by British interests. The transaction is of great importance in further strengthening British shipping interests in the Far East. The vessels acquired are: INDRA, 5,173 tons; INDRADEO, 5,359 tons; INDRAGHIRI, 5,723 tons; INDRAKUALA, 5,691 tons; INDRASAMHA, 5,197 tons; INDRAWADI, 5,194 tons; and INVERCLYDE, 4,395 tons. Holt & Co. are now probably the largest private ship owning company in the world, having about 80 ships, ranging from 4,000 to more than 14,000 tons, mostly in the Far East.

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A Wet Christmas Off Cape Hatteras

When Southern Cross Left the Philippines She Reckoned Not on the God of Storms Who Cares Nothing for the Plans of Men

By Captain George S. Laing

WHEN SOUTHERN CROSS left Cebu in the Philippines, bound for New York, the entire crew from cook to captain felt certain that long before Christmas they would be quietly moored in the East river. Everything seemed to be in the ship's favor. Four months was ample time for the trip, the gods being willing. Copra and manila comprised the cargo, with a little water ballast in the cellular bottom for stiffening. The ship was well found and the crew was a good one. But windjammers are deceitful jades. All went well until the day before Christmas, and then——

The easterly wind freshened suddenly at sunrise that day. By nightfall SOUTHERN CROSS was lying over to port under her three lower topgallantsails. At four bells, the order was given to furl these and the crojak. At eight bells, the mainsail was furled.

"Now we have her snugged down," said the captain, "but it is going to be a stormy Christmas."

"Yes, sir," replied the mate. "The aneroid and mercurial barometers read close to 29.70 and they're falling fast."

Cape Hatteras is the junction point of the gulf stream and the arctic current, and both the sea and the wind seem to go mad within a radius of 200 miles of the Diamond shoal light vessel. The seas resemble black hills of racing water surmounted with crests of granite.

The wind was now howling and screeching into a 50-mile gale. Accordingly the upper topsails and foresail were furled to prevent their being blown away. This left the ship under three lower topsails and two staysails, quite enough for such a night.

A glance at the barometer showed it registering 29.40. It had dropped 0.3 inch in an hour. A Cape Hatteras gale was upon us. There was no time to lose. "Bang!", there was a monster! The lee rail dived clear under. Tons of water rushed up and down from the fore hatch to the mizzenmast, then from weather rail to lee scuppers. Down she plunged to windward, rising just in time to dodge the next mountain.

Was it dark? No darker than when one shuts his eyes in a cellar. If there had been ten moons behind the scud it would still have been dark. The only glimpse of light came when an extra heavy sea fell a trifle short of the weather rail and burst its pent-up power on the ship's iron sides, and the fume and froth in the boiling cataract lashed itself into white fury, causing a momentary glare.

There was no room for Christmas sentiment on board SOUTHERN CROSS. Midnight and the relief of the watch brought few words. Hove to on the starboard tack, first falling off the wind into the trough and then wallowing back a little closer to the gale, the ship fought out the gale.

The weather leeches of the sails shivered as she dived. Had the bowsprit broken off short and the royal and topgallant masts fallen about our ears, no one would have been surprised.

Motion! Motion! How could the ship stand it? God help the man who had to make his way along that deck before daylight! In such inky darkness, the onslaught of the seas would deceive an albatross. Again and again we felt her shiver and quake. A wave filled her up to the pin rails. She hesitated and stood stock still for half a second. Then 120 tons of salt water rushed over the lee rail and out at the gaping ports and scuppers. Down she would fall again to windward. The graveyard watch, on duty from midnight to 4:00 a. m., had gone, and the light of day was eagerly anticipated. Side lights and galley fire were hopelessly extinguished. Some of the running gear was tearing itself to pieces. Lift and halyard blocks hammered away against the standing wire rigging and masts.

Two men were required at the wheel, one to windward and one to leeward; even then she threatened to throw them both overboard. The captain had been under the mizzen weather-cloth all night, conferring now and then with the mate in charge of the watch. At the bottom of the companion stairs lay the mate who was off watch, in his reefer jacket and gum boots, sleeping with one eye open.

The wheel was relieved every two hours. The vessel was continually awash. In temporary lulls a rush was made from the forecastle to poop deck or vice versa. No lookout man could stay on the forecastle head, and it would have been murder to ask one to attempt it. Spray flew high in the air, as the granite toppers pounded the iron bulwarks. Noise could not describe the incessant roar of the tempest.

With the dawn the squalls became less violent. A short life line was stretched from taffrail to the break of the poop to allow the wet and silent watchers to steady themselves as they attempted a little exercise for their benumbed limbs. The hatch covers looked soft, for most of the dressing had come out with water friction. Quarter pipe plugs were all gone, a lee port had dropped off, a dozen ropes that were

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washed off the pin rails had chafed themselves almost through at the nips. The weather life boat lay wrecked on the skids.

By the noise that came up from the saloon companion-way, the steward must have been up to his knees in broken dishes. Perhaps it was just as well we couldn't hear what he was saying to the cook.

With the increasing light came more frequent lulls in the gale. "This is Christmas and I am going below to have a nap", declared the weary skipper. The glass was rising again. By noon the wind and sea had lost their savagery. The cook from his wrecked galley strove to prepare a meal worthy of the day. At nightfall SOUTHERN CROSS was under full upper topsails and on her course again, and the seamen began to wonder if she could make port before New Year's day.

"What's that to leeward, above the horizon?"

"That," said the 'old man', "is the vertical shaft of light from the Diamond Shoal light vessel. How she ever hangs onto her anchorage in such a hell of a place was always a puzzle to me. Shake hands, mate; Merry Christmas! The sight of that great light is a fine Christmas gift to those who plough the ocean for a living.

"Take the compass bearing of the light, sheet home the lower topgallantsail and tell the steward to give the boys a drink!"

Ships at Panama

The 83 ships held up at the Panama canal by the slide in the latter part of September have been reduced to nine on the Pacific side and one on the Atlantic side, not including the ships of the Luckenbach line which come and go in the maintenance of a regular service, trans-shipping cargo by means of the Panama railroad. The ships on the Pacific side are the yacht SULTANA, the training ship NEWPORT, the dredge SAN DIEGO, and the commercial vessels ADMIRALEN, GRAHAMLAND, NAVAJO, EDISON LIGHT, NEWTON and LADY CARRINGTON. The vessel held up on the Atlantic side is ACAJUTLA.

Washington dispatches quote the department of commerce as stating that over 11,000 seamen have been examined and approved under the new La Follette seamen's law.

Farr Appointed President

M. E. FARR, president of the Detroit Ship Building Co., was chosen at a recent meeting of the board of directors of the American Ship Building Co. to succeed the late Edward Smith as president. O. J. Fish, secretary and treasurer, was made vice president. This promotion was the second in three years and was extended by the directors in recognition of Mr. Fish's able services. He has been associated with the American Ship Building Co. longer than any of the other officials. A. G. Smith, general manager, was elected a director. Three other vacancies in the board of directors also were filled. The new directors are Kellogg Fairbanks and Charles L. Strobel, Chicago and Moreau Delano, New York. The office of chairman of the board of directors is still vacant. J. S. Gorman was elected auditor.

M. E. FARR

Mr. Farr as head of the Detroit subsidiary of the American Ship Building Co., is a prominent figure in Great Lakes marine circles. He was born in Clayton, N. Y., Oct. 5, 1863, and after graduating from the Clayton high school followed the lakes for one season. He then entered the employ of the banking firm of Elias Farr & Co., Marquette, Neb., and when only 21 years of age was made cashier of the bank. One year later he was given full charge of the bank's affairs. In 1892 he entered the employ of the Detroit Dry Dock Co., becoming secretary and treasurer in 1899, vice president in 1905 and president in 1907. At the present time Mr. Farr is also president and treasurer of the Calcite Transportation Co., a director of the Scotten-Dillon Co., and of the First & Old Detroit National Bank. In addition, he is interested in a number of business enterprises in Detroit. He has taken a leading part in the educational, charitable and philanthropic affairs of the city.

New Pacific Line

The China Mail Steamship Co., which was organized on the Pacific coast, for traffic between San Francisco and China, is financed wholly by Chinese in the United States. The former Pacific Mail liner CHINA, which was secured by the new company, has inaugurated the service.

The capital of the China Mail Steamship Co. is said to be $2,100,000. Besides acquiring CHINA the company is said to hold options on other steamships. Look Tin Eli, president of the Canton bank of San Francisco, has been active in the negotiations that preceeded the formation of the China Mail Co. The original plan called for the co-operation of Chinese on both sides of the ocean. San Francisco Chinese, however, intimated that they preferred to have the project financed in this country, CHINA is a vessel of 5,060 gross tons and 3,186 net tons.

Owing to low fruit prices, the EASTLAND disaster, and the fear that the new seamen's law will cause added difficulties in the operation of its vessels, the Graham & Morton Transportation Co., 35 years old and considered one of the strongest passenger lines on the Great Lakes, is in the hands of a receiver. The assets of the company are valued at $1,400,000 and the liabilities are listed at $600,000. The company owns five steamers, CITY OF BENTON HARBOR, CITY OF GRAND RAPIDS, CITY OF TRAVERSE, HOLLAND and PURITAN.

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Ship Brake Tests in a Model Tank

Government Experts Decide That Practical Type Should Be Lever-Controlled From Ship's Bridge — Mechanism Must Be Simple

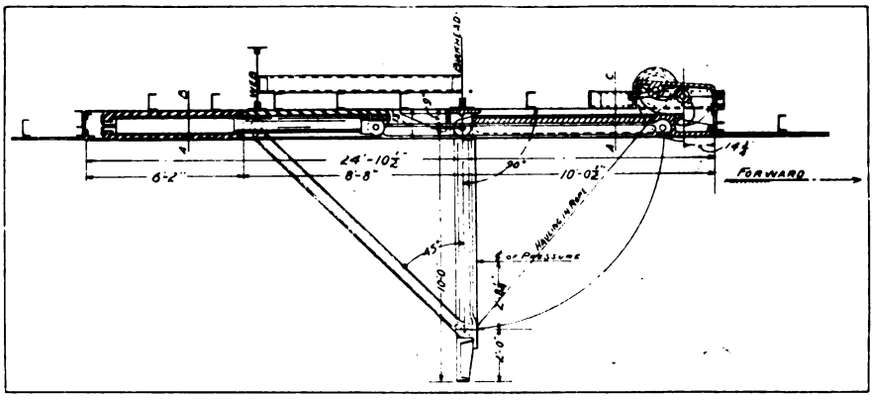
By Capt. Wm. Strother Smith, U. S. N.

INTERESTING data have been obtained in the model tank at the navy yard, Washington, during experiments made to determine whether or not it was feasible to design and install a brake on the side of a merchant vessel to assist in stopping a steamer when in danger of collision or grounding. The question of installing such a brake is a financial one and is dependent upon the lessened insurance demanded and the advertisement of such an appliance to increase the passenger list. It is not one for the naval architect or marine engineer to solve and is not brought up for discussion on that point. In the spring of 1910, a set of trials was made on the U. S. S. INDIANA off Delaware breakwater to determine the effect of the Lacoste ship brake. Due to a lack of preliminary investigation, this trial showed very little either for or against the brake and it was some time after that the writer was requested by personal friends to take up the study with a view to designing a practical brake. After the loss of TITANIC, interest was awakened to such an extent that a syndicate was formed and the permission of the navy department was obtained to make a series of trials in the model tank, the results of these trials being available through the courtesy of the Lacoste Shipbrake Syndicate.

The Wm. Cramp & Sons Ship & Engine Building Co. was kind enough to furnish the lines of ST. LOUIS, and a model of this vessel was constructed. Three runs were made to determine the curve of speed and power before fitting any brakes, and the successive ten runs were made with different areas and settings of the brake to determine the resistances and pressures per square foot. ST. LOUIS is 536 feet in length, 62 feet 9 inches beam, and the draught at load line was 28 feet for model experiments, the displacement being about 17,230 tons. The following deductions were made:

The stopping power varies directly as the projected area opposed at 90 degrees to the fore-and-aft line.

One pair of brakes is more efficient than two, as shown by a test run in which the combined area is 624 square feet for the two brakes, and the stopping power or resistance opposed is not in the same proportion as that of the pair 12 feet by 14 feet, giving 168 square feet. The pressure per square foot practically decreases as the width of the brake is reduced and, by plotting curves of pressures at various speeds for different widths of brake, it is found that after a certain width is passed the pressure per square foot is not increased.



DESIGN OF SHIP BRAKE USED IN MODEL TESTS

The model was also fitted with a pair of brakes of 11 feet 8¼ inches projected area, by 14 feet deep, fitted so as to be tripped and thrown out from the traveling carriage of the model tank. A set of guides was fitted so as to keep the model in position under the carriage, yet allow it to advance freely when the carriage was stopped. The foot-way along the tank was marked off in equal distances from a certain point far enough from the starting point to allow the carriage to reach the proper speeds. The model was then brought up to speed, the carriage stopped at the determined point, the model released with the brakes thrown out, and the times marked by stop-watches at each marked distance until the model was brought to rest or the limit of the tank reached.

Interesting data showing the instantaneous stopping effect of a pair of brakes of different sizes were compiled, as shown in the accompanying table.

The experiments conducted on INDIANA showed very little. The vessel was entirely unsuitable, owing to the fact that there is not a straight line in any part of her hull and the brake had to be fitted on by means of a molded frame. There were no accurate means of determining the total instantaneous indicated horsepower nor the exact speed. When the subject was revised, the model tank was considered by far the most accurate method of determining the data to be used in designating a brake. To satisfy the ideas of many concerned, various forms of the brake were considered, principally with the idea of controlling the brake by power so as to open and close at will, the vessel going at full speed. The four plans were as follows:

Long hydraulic cylinders are installed athwartship on a stiffened bulkhead to work connecting rods attached to the brakes. This involved an additional weight of about 190 tons, including 33 tons of contained water.

In order to reduce weights, especially that of contained water, a toggle joint arrangement was studied to reduce the power required and to reduce the peak load when the brakes were to be started in. This involved a stress of 340,000 pounds on each of three principal connecting rods and 320,000 pounds on each of three lesser members.

A rack and pinion arrangement, allowing very little contained water was designed. The diameter of the vertical shaft working the pinions and the width of the gear needed rendered this scheme out of consideration. Another plan was adopted with the idea of pushing the brake out to 35 degrees to assist the rudder. This required too much machinery to develop the power necessary, about 500 estimated horsepower for a pair of brakes 9 by 13 feet.

Many other schemes were studied out, but the weights and power required

From a paper read at the Twenty-third general meeting of the Society of Naval Architects and Marine Engineers, New York; Nov. 18 and 19, 1915.

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made any and all of them impracticable. The final conclusion reached was that the simplest and only practical form of brake would be one set in the side of a vessel, to be released instantly by the officer on the bridge by throwing a lever and open by the pressure of the water without further thought; and to be supplied with only enough power and mechanism to haul in the brake when the vessel was stopped or going astern and lock it fast for future use. With these points in view, a type design was made for the Canadian Pacific steamship EMPRESS OF ASIA, practical, strong and simple, for emergency use only. The officer on the bridge has but to pull a lever and the brake will open and exert its resistance. When the danger is past, it requires but the attention of one man on each side to haul in and secure the brake.

Stopping Effect of Ship Brakes

Size of brake in feet. Wide	Deep	15	16	17	18	19	20	21	22	23
12	14	13,000	15,500	18,250	21,750	23,250	28,500	32,200	35,250	38,500
10	14	10,600	12,750	15,000	17,500	20,000	22,500	25,600	28,300	30,400
8	14	7,850	9,500	11,250	13,500	15,500	17,500	19,800	21,900	24,000
6	14	5,300	6,400	7,590	9,100	10,460	11,810	13,360	14,780	16,200
12	13	11,800	14,100	16,600	19,800	21,100	25,900	29,300	32,000	35,000
10	13	9,600	11,600	13,600	15,900	18,000	20,400	23,300	25,750	27,660
8	13	7,100	8,600	10,200	12,250	14,100	15,900	18,000	19,900	21,800
6	13	4,650	5,650	7,650	8,250	9,500	10,700	12,100	13,400	14,700
10	12	8,600	10,400	12,300	14,300	16,000	18,300	20,900	23,175	24,880
8	12	6,300	7,700	9,100	11,000	12,600	14,300	16,000	17,900	19,600
6	12	3,900	5,050	6,850	7,400	8,500	9,600	10,800	12,000	13,200
10	10	7,000	8,600	10,100	11,900	13,300	15,200	17,000	19,300	20,700
8	10	5,200	6,400	7,500	9,000	10,400	11,800	13,100	14,500	16,200
6	10	3,100	4,100	5,600	6,100	7,000	8,000	10,100	12,000	13,200
8	8	4,100	5,100	5,800	7,000	8,300	9,400	10,400	11,500	12,000
6	8	2,400	3,200	4,300	4,700	6,500	7,400	8,200	9,000	9,500
6	6	1,700	2,200	3,000	3,200	4,600	5,400	6,000	6,600	7,000

Government Ownership

(*Concluded from Page* 1.)

date private capital and thus slow-up the construction program now in full swing.

The sober fact is that America—the world for that matter—needs more ships, and even a Democratic administration cannot create ships out of thin air. Our ship yards on both coasts and the Great Lakes are crowded now to their utmost capacity. We are building vessels at a rate never before approached in this country. Furthermore, every available bottom has been pressed into service; rusty tramps creaking at every joint have been hauled out from their hiding places and put to sea; even windjammers that for years lay in the mud of tidal marshes have unfurled their mildewed canvas and headed out on the long, down trail that is always new. All this under private ownership and in the face of the most discouraging code of maritime laws that ever disgraced the statute books of a great commercial nation.

With the situation as it is, what is the use of overturning our national traditions and rushing into government ownership? What will it avail? It can have no other effect than one of strangulation; no other result than to throttle the life out of a newly fledged and struggling commerce.

Wants Law Changed

A recent statement, issued from the office of Gus. Kitzinger, president and general manager of the Pere Marquette Line steamers, Manistee, Mich., is as follows:

"The provisions of the seamen's law are particularly burdensome to the owners of small boats that have been operating with a single crew on runs of 13 hours a day or less. In many cases, boats that have been operated very satisfactorily with six or seven men will now be obliged to carry a crew of 12 or 14.

"This fact, taken with the deck space that must be devoted to their sleeping and dining quarters, reducing freight capacity, and the reduced number of passengers allowed, will make it impossible in most cases to run such boats at a profit, and practically destroy the investment. It will also leave many small ports, which are dependent on such boats, without transportation services.

"It is thought that the owners of such boats, and the authorities of ports affected, should get together to work for the repeal or amendment of the impracticable portions of the measure as it stands at present.

"Gus. Kitzinger, president of the Pere Marquette Line steamers, Manistee, has undertaken to arrange preliminaries, if parties interested in the solution of this important problem will write him at once."

November Lake Levels

The United States lake survey reports the stages of the Great Lakes for the month of November, 1915, as follows:

Lakes.	Feet above mean sea level.
Superior	602.89
Michigan-Huron	579.52
Erie	571.46
Ontario	244.94

Lake Superior is 0.14 foot higher than last month, 0.44 foot higher than a year ago, 0.42 foot above the average stage of November of the last 10 years, 0.62 foot below the high stage of November, 1900, and 1.39 feet above the low stage of November, 1879. During the last 10 years the November level has averaged about 0.2 foot lower than the October level and 0.2 foot higher than the December level.

Lakes Michigan-Huron are 0.29 foot lower than last month, 0.36 foot lower than a year ago, 0.77 foot below the average stage of November of the last 10 years, 3.40 feet below the high stage of November, 1876, and 0.34 foot above the low stage of November, 1895. During the last 10 years the November level has averaged 0.3 foot lower than the October level and 0.2 foot higher than the December level.

Lake Erie is 0.53 foot lower than last month, 0.01 foot lower than a year ago, 0.35 foot below the average stage of November of the last 10 years, 2.21 feet below the high stage of November, 1861, and 0.76 foot above the low stage of November, 1895. During the last 10 years the November level has averaged 0.3 foot lower than the October level and 0.1 foot higher than the December level.

Lake Ontario is 0.23 foot lower than last month, 0.31 foot lower than a year ago, 0.69 foot below the average stage of November of the last 10 years, 2.88 feet below the high stage of November, 1861, and 1.53 feet above the low stage of November, 1895. During the last 10 years the November level has averaged 0.2 foot lower than the October level and 0.1 foot higher than the December level.

Stevedores handling Oriental freight in Seattle have announced a uniform rate of 50 cents per ton wharfage, which is the same as that charged to Alaska. All the docks and steamship companies in Seattle interested in the Puget Sound-Oriental traffic have adopted the new uniform rate. It is claimed it was absolutely necessary to readjust the rates as the tremendous freight offerings had increased the cost of labor.

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How Ships Act on Backing Trials

Some Observations of Actual Trials Under Varying Conditions and Some Unlooked for Results—Measurements Carefully Made

By Henry Penton

THE QUESTION of the behavior of ships under certain conditions, such as backing at full speed in case of impending collision or stranding, is not new. It has arisen frequently in admiralty cases and in numerous instances of damage, actual or claimed, which do not reach court. There appears to be practically no authentic record of any observations, nor, in fact, accurate information of any sort, on the subject. Having occasion recently to look into the question, and being unable to find anything beyond common report, or verbal statements of an exceedingly general character, and usually based upon incidents bound to affect the interest of the observer, the writer decided to do some experimenting where the only conditions were the making of observations as accurately as possible.

Diagrams and data are herewith presented from two steamers. They represent both easy and medium lines, the block coefficient of *A* being 75 per cent and of *B* 80 per cent. Both are fairly high powered ships, the power available for backing in *A* being about 0.35 horsepower per ton of full load displacement, and in *B*, about 0.25 horsepower. These compare with about 0.13 to 0.15 horsepower in the average bulk freighter.

The trials were made at two different displacements in each case. The objectives were:

1.—To determine the time required to bring the ship to a stop from normal full speed.

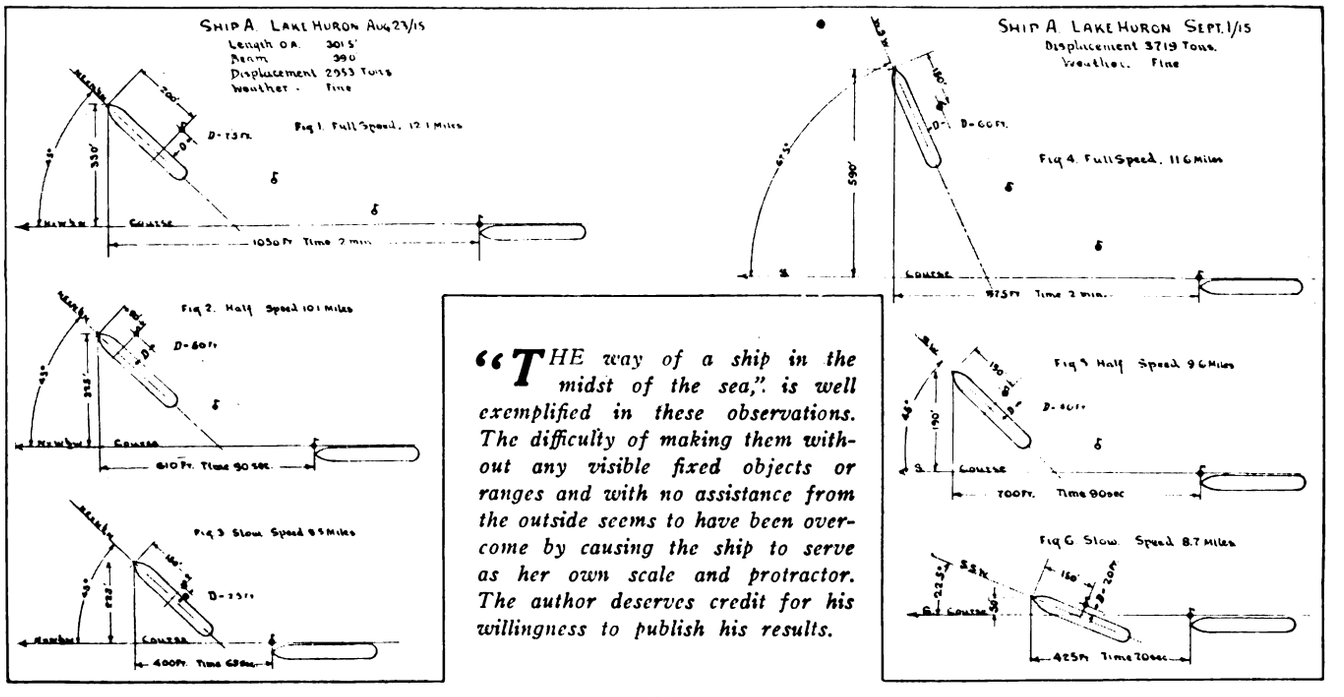
2.—To determine the distance covered (a) on, or parallel to, the normal course, and (b) the actual distance covered by the ship's head.

3.—To observe the change in heading, if any, while bringing ship to rest, and its effect upon the ship's position.

Weather Conditions

The intention was to make observations under three different conditions, in other words, full, half and slow speeds. In the case of ship *B*, however, the trials, Figs. 7 and 8 with the ship nearly light, were made in a stiff head breeze which not only reduced the normal speed materially and probably exercised considerable influence upon the backing period and distance, but made the slow speed trials of doubtful value. The other trials of both ships were all made in clear fine weather.

Since the experiments were all made in the open lake the ship herself was employed as the unit of measurement of distance. A man was stationed forward with a number of markers; an observer was placed at the taffrail in view of the bridge; at an agreed visual signal from the latter the master shifted his telegraph to "Full Astern" and at the same instant repeated the signal to the man forward who threw a marker overboard. The whole operation occupied not over two seconds. As the marker came abreast of the taffrail the observer repeated his signal and another marker was put over, this being repeated as often as necessary, the observer noting the distance from the ship as they came aft and finally moving forward to meet the last one, and, when the ship's headway appeared entirely gone, noting position, distance from ship and elapsed time. It will be observed that this distance is very important, in conjunction with the ship's heading, in establishing her position and drift. By the latter term is meant the setting or reaching of the ship bodily along a line parallel to her course even with her head swinging at a considerable angle. An inspection of the diagrams will show that this heading did occur to a considerable extent. In plotting it was assumed that the


SHIP A. LAKE HURON Aug 23/15
Length O.A. 301.5'
Beam 39.0
Displacement 2953 Tons
Weather - Fine
Fig 1. Full Speed. 12.1 Miles
D-73 ft.
Course
1050 Ft. Time 2 min.
Fig 2. Half Speed 10.1 Miles
D-60 ft.
610 Ft. Time 90 sec.
Fig 3 Slow Speed 8.5 Miles
D-55 ft.
400 Ft. Time 68 sec.
SHIP A. LAKE HURON SEPT. 1/15
Displacement 3719 Tons.
Weather. Fine
Fig 4. Full Speed. 11.6 Miles
D-60 ft.
975 Ft. Time 2 min.
Fig 5 Half Speed 9.6 Miles
D-60 ft.
700 ft. Time 90 sec
Fig 6 Slow Speed 8.7 Miles
D-20 ft.
425 ft. Time 70 sec

"THE way of a ship in the midst of the sea," is well exemplified in these observations. The difficulty of making them without any visible fixed objects or ranges and with no assistance from the outside seems to have been overcome by causing the ship to serve as her own scale and protractor. The author deserves credit for his willingness to publish his results.

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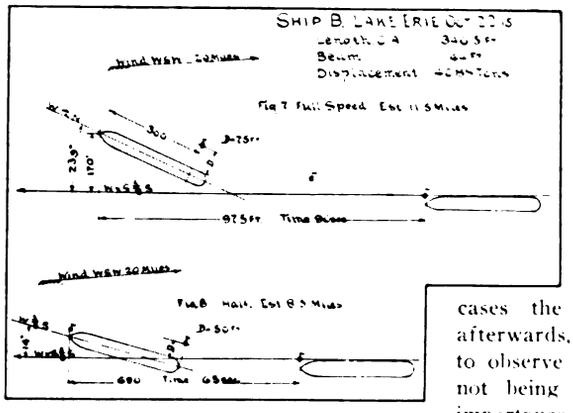


FIGS. 7 AND 8—FULL SPEED 11.5 MILES

total swing was uniformly divided through the distance traveled, and observation of the position of the markers indicates this to be approximately correct. The ship's *apparent* position, however, is virtually dependent upon this assumption and the estimate of the distance of markers from ship as they are passed. The distance moved through by head of ship is practically independent of this, because, while it is true that as the ship is moving upon a curve, the markers would indicate chords having a length slightly less than the ship, the difference is so slight as to be negligible. The distance parallel to course, also the deviation, therefore, are dependent upon the accuracy of estimate of the position of the markers, or the length of base of a triangle of which the ship is one side and the distance between markers is another. The actual distance traveled by the ships, particularly at full speed, is, therefore, materially greater than that on, or parallel to, the course, and may be looked upon as fairly accurate. The distance parallel to course, as well as the deviation, are scaled from plotted position and are therefore approximations, but are accurate enough for all practical purposes.

The full speeds, except in case of Figs. 7 and 8, are practically exact; the half and slow speeds are determined by propeller revolutions as proportional to full speed. This assumes constant slip, which is, of course, not exact, being probably slightly less at half and slightly higher at slow, but is near enough for all practical purposes.

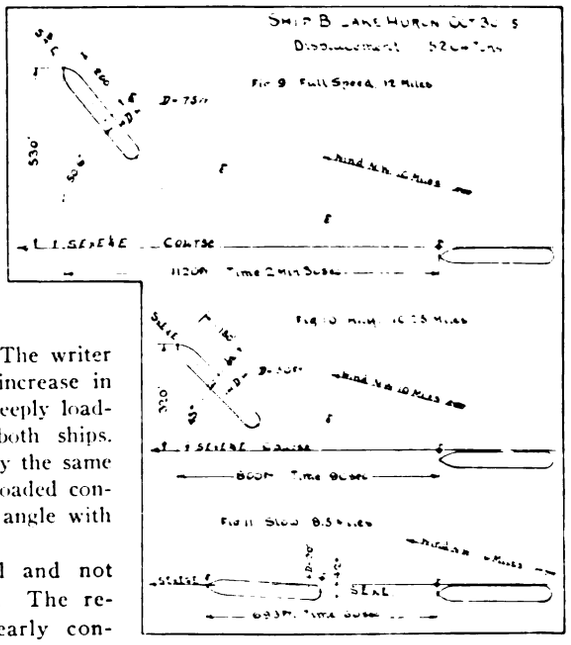
In all cases the ships were backed at full power and entirely unannounced; the full speed trials in particular were surprise tests in the fullest degree. In all cases the helm was in midship position.

The time shown is that observed from shifting of telegraph to "Full Astern" to signal to stop engines, or when ship was apparently stopped so far as headwise movement is concerned. It is not certain, however, that the ship was not still moving sidewise with relation to her course; in fact, while the headings shown are those noted at the moment of stopping engines, in all cases the ship continued her swing afterwards, though no effort was made to observe how far this would continue, not being considered as of any great importance. Similarly the drift, or set, after stopping was not noted, though in case of imminent stranding this might be of consequence. The velocity, however, would necessarily be so low that resultant damage would be improbable.

All these features are, however, subject to the influence of winds, currents and depth of water and to some extent to the type of ship and her displacements.

The backing signals were responded to promptly, even more so than is likely to be the case in all instances, but it is entirely probable that few would credit the fact that such a ship as *A*, with easy lines and large power, would run a fifth of a mile before coming to rest. Examination of Figs. 1 and 4 will show that the ship head-reached through nearly the same distance in each case though the displacements were radically different, but the distances parallel to course are substantially different, due to the much greater angle of swing in Fig. 4. In this case the head-reaching, as will be noted from diagram, is 1,054 feet and 1,145 feet, respectively. The same thing is evident in ship *B*, Figs. 7 and 9. In the former, the head-reach amounts to 992 feet and the latter 1,238 feet (a quarter of a mile, practically), while the difference in movement parallel to course is only 145 feet. This, however, is partly accounted for by the difference in wind conditions, as is also evident from the difference in times. The writer fully admits surprise at the increase in angle of swing in the more deeply loaded condition, as shown in both ships. Ship *A*, swung through exactly the same angle at all speeds in partly loaded condition; both ships reduce the angle with speed in loaded condition.

The diagrams are typical and not the result of solitary trials. The results were found to be nearly constant, but as noted above are subject to extraneous conditions. Considerable other data were also collected, including peculiarities of propeller action, which need not be added here. Observations on large bulk freighters probably will be added later if the writer can find opportunity to prepare them. Meantime the foreging is offered as a contribution to the general information on this subject.



FIGS. 9 TO 11—FULL SPEED 12 MILES

Release Canadian Boats

The British admiralty has released the Canadian Pacific liners EMPRESS OF ASIA, EMPRESS OF RUSSIA and EMPRESS OF JAPAN from the government transport service. The three vessels are now being refitted for the passenger and freight business at Hong Kong. Under these circumstances the company has announced that these steamers will enter the commercial service between Vancouver, Manila, Japan and China at an early date. The addition of these vessels will aid greatly in relieving the acute freight situation on the Pacific, which has been controlled solely by the Japanese since the withdrawal of the Pacific Mail Steamship Co.

Government May Buy Eastland

The steamship EASTLAND, which tipped over in the Chicago river July 24 with a loss of 812 lives, may be used as a government naval training ship. Capt. Edward Evers, of the Illinois naval reserves, states that an investigation is now in progress to satisfy naval authorities at Washington as to the seaworthiness of the boat. Alterations are to be made in the hull to remove all danger.

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In the Traffic Manager's Office

A Review of the Charter Market on Coasts and Lakes—Pointers for the Men Who Get the Business

More New Steamship Lines Established

ONE of the most interesting features of recent shipping news is the rapid progress being made in the formation of new steamship lines.

Philip Mason, New York, recently returned from China, where he concluded arrangements for the organization of the Pacific & Eastern Steamship Co., Inc., which will operate steamship services, under the American flag, between China, the Philippines, and the Pacific and Atlantic coasts of the United States. The company is a joint American and Chinese enterprise and has just been incorporated under the laws of the state of New York. It will commence business with a capital of $2,000,000. Half of the capital has been subscribed by American and half by Chinese. The directorate consists of seven members, four American and three Chinese. The American interests are represented by F. Mertens's Sons, Cumberland, Md., and Washington, D. C. The Chinese interests are represented by Chinese capitalists in Shanghai and Canton. The president of the company is John Mitchell Jr., of the firm of F. Mertens's Sons. Mr. Mitchell is also president of the Washington and Southern bank, Washington, D. C. Philip Manson is managing director. The company expects to buy or charter steamers so that sailings may begin as soon as possible and also plans to build new steamers to be delivered as quickly as possible. The principal office of the company in the United States is in New York; the principal office in China is in Shanghai.

A new line of steamers, forming another direct monthly service between New York and Canary island ports, has been inaugurated by the arrival at Las Palmas, Grand Canary, of the first vessel dispatched by the Ocean Transportation Co., New York. Three steamers have already been announced as placed on the new line, and this number will be added to so as to permit of a regular monthly service in each direction. The first vessel reloaded here with fruit for Barcelona, where return cargo direct to the United States was waiting for shipment. The Swedish Steamship Co., Helsingborg-Luggude and Vola, has established a new freight line to England, known as the Swedish Line Liverpool-Manchester-Baltic. The object is to carry piece goods from Liverpool and Manchester to Sweden and eventually to Denmark and other Baltic ports, where cargoes will be received for the British West Coast. The line will consist of three steamers and will begin operations shortly.

A new line of steamers with regular sailings has been established between Bilbao, Spain, and various ports in England. The vessels will touch, after leaving Bilbao, at such Spanish ports as may offer cargo, as well as at Oporto and Lisbon in Portugal, and sail thence to Tyne, Tees and Hull, touching at London, Middlesbrough and Newcastle. Armstrong, Lord & Co., of Newcastle-on-Tyne, are directors of the lines Frutera and Affriteurs Reunis and the vessels of both of these companies will be engaged in the service now inaugurated. Modesto, Pineiro y Cia, of Santander, are the Spanish agents of the new line, which is to be known as the Intera.

An official announcement has been made regarding the new Pacific steamship company which has been formed in Holland under the name of the Java-Pacific Line, and the first steamer of which was dispatched from Batavia, Dutch East Indies, on Dec. 15, for San Francisco. There will be four boats on the run, giving practically monthly sailings. The average capacity of these boats will be from 10,000 to 12,000 tons. The Java company's boats will carry a limited number of first-class and steerage passengers. The boats of the other lines will probably carry only steerage. The companies interested in the new Pacific service are the Java-China-Japan Line, the Nederland Royal Mail Line, and the Rotterdam Lloyd Royal Mail Line. The first-mentioned company will furnish two of the boats and the two others one each. If the business warrants, other boats will be added later.

The inauguration of this service is no doubt due in some considerable measure to the efforts of the government of the Philippine islands, as it was necessary to relieve the difficulties which resulted from the withdrawal of the Pacific Mail by inducing other lines to include Manila among their ports of call. The San Francisco chamber of commerce has likewise been deeply interested in the extension of the Java Line to the Pacific Coast.

Ten or 12 years ago, the Java-China-Japan company considered the advisability of extending its service to Vancouver, but it was deemed then that the conditions did not warrant an Oriental-Pacific connection. Following the withdrawal of the Pacific Mail, and as a result of the abnormal freight rates, it was decided that all interests would be materially benefited by the service.

Germans Lose Money

The German merchant marine has for thirteen months been practically inactive, and only a few steamship companies maintain an irregular service with Scandinavian countries, and between Emden, Hamburg and the Baltic German ports and also to Libau in Russia.

This service, as is frankly acknowledged by the companies, is only partly covering operating expenses, and no information can be had as to the cost involved in keeping in trim steamers interned in American, Portuguese, and Spanish and other ports, together with the cost of maintaining the chain of branch offices in Germany and abroad. Naturally, it would be difficult to obtain accurate figures in this respect, and the fact remains that, in spite of the lack of yearly balance sheets of the companies, a number of steamship companies, such as the Hamburg-South American Steamship Co., the German Kosmos line and others, have paid dividends. A number of the larger companies were able to reduce expenses by utilizing their well-organized equipment on land for military purposes, such as commissary department, etc. According to Lloyd's register, 370 steamers with an aggregate tonnage of 846,000 tons have fallen into the hands of Germany's enemies. On

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the other hand, a number of companies have taken advantage of the favorable market and have disposed of some steamers at good prices. The program of the German steamship companies has been maintained in some degree, as during the first year of war a number of new ships were launched from German yards. No prediction can be made as to the volume of ocean traffic after the war, because just as little as can be said about the future development of the German foreign trade, no conclusions can be formed as to the change in the situation brought on by the entry of neutral shipping companies into the territory formerly occupied almost exclusively by German steamship lines.

ler to unite Cuba with the United States by means of the over-sea railway extension of the Florida East Coast Railway and the P. & O. ferry-stemer service. This idea is now bearing abundant fruit. The business of the ferry service is growing so rapidly that the company has, it is reported, ordered the construction of a second ferry steamer similar to the HENRY M. FLAGER, now in operation, making daily trips between Havana and Key West. This vessel can carry 30 loaded standard freight cars. The service has been a complete success in every detail and will be a special boon to the fruit and vegetable shippers of Cuba, as it does away with the necessity of transferring freight from car to steamer and vice versa at the terminals.

Petition Denied

As a result of the recent order by the interstate commerce commission denying the application of the commercial exchange of Burlington, Ia., and other western cities, for a reopening of the lake line case, it is believed railroads operating vessels on the Great Lakes have abandoned plans to go to court in an effort to retain their interest in steamship lines. The Panama canal act, it is pointed out, gives the commission absolute authority to order the divorcing of a rail line and a steamship line when convinced that joint ownership of the two is against public interest. This is the position taken by the commission in its original order in the case.

Since the commission's first order, it is asserted, lake rates have advanced about 200 per cent. This, it is declared, is not entirely due to the commission's order, but is ascribed partly to the effect of war conditions on marine tonnage, resulting in a tremendous demand for cargo space for ocean-going freight, which caused large tonnages to be withdrawn from inland waters and transferred to ocean routes.

American Ship Builders Are Rushed

CAREFUL estimates now place at about 90 the total number of sizeable merchant vessels closed with Atlantic yards since the active ship-building movement, now in full sway in this country, was inaugurated. The greater number of these boats yet is to be completed, since the yards have their capacity sold so far ahead that few of them are able to promise deliveries much under two years from the present date. The contracting demand for new ships is as active as ever. This continues to lead to projects for providing new or enlarged building capacity. A new company known as the Continental Trading Co. has acquired and is rehabilitating the old Mallory shipyard, Mystic, Ct. It is understood that this company has received orders for three fair-sized boats from Norwegian shipping interests. The Standard Shipbuilding Co., which recently purchased the Shooters island shipyard in New York harbor, now is figuring actively on work and has four 8,000 to 9,000-ton boats in view.

The Southern Pacific Steamship Co. has awarded to the Newport News Shipbuilding & Dry Dock Co., contracts for two cargo boats of about 5,000 tons gross each, and for a tank steamer of about 7,500 tons gross. The Harlan & Hollingsworth Corporation has received a vessel from the Ocean Steamship Co. for Savannah traffic. The Wm. Cramp & Sons Ship & Engine Building Co. took two more tank ships for the Mexican Petroleum Co. and the New York Shipbuilding Co., one vessel for the Pocahontas Fuel Co. and an additional boat for the Coastwise Transportation Co. The cramp yard also has been awarded a duplicate of the large car ferry built some months ago for the Florida East Coast railroad. Other vessels placed recently were two tankers for the Standard Oil Co. to the Harlan & Hollingsworth Corporation and one for the same company to the Newport News yard. The Chester Shipbuilding Co., which has revived the old Roach yard at Chester, Pa., has four vessels under contract for Norwegian interests.

New Dock at Havana

The new terminal dock and warehouse of the Peninsula & Occidental Steamship Co., at Havana, Cuba, have been opened for business. The Peninsula & Occidental is the first steamship line to possess its own dock and terminal at that port. The inauguration of this service means added convenience and comfort for passengers arriving and departing, since it obviates the necessity of using tugs or lighters for their transfer to and from the vessels. Apparently no detail has been overlooked to make the dock and warehouse buildings complete and modern in every respect. The brick and iron construction renders them as nearly rat-proof and fireproof as possible. Space also has been provided at the new terminal for the offices of the company, but a city ticket office will be maintained as before for the added convenience of passengers. The erection of the terminal has involved a considerable expense to the company. It was the idea of the late Henry M. Flag-

British Steamers Costly

British ship brokers report an unprecedented demand for new and second-hand steam vessels, prices rising daily for several weeks. Many owners, it is said, have secured employment since hostilities began, at rates which would pay the first cost of their ships in one or two years. Vessels which realized $30 per ton deadweight a year ago, are being sold for almost twice that sum now; and second-hand steamers also are worth more than double the price paid for them a year ago. Several craft from 10 to 15 years old have been recently sold for more than their original cost.

Belated advices received from Shanghai state that a shipping company at Odessa has decided to place with a Japanese dock company an order for constructing several passenger steamers of a large type. The order is understood to include eight steamers.

Aid rendered by the government radio service to American ships which met with accident or disaster during the past fiscal year resulted, with but one exception, in the saving of all but two lives. The exception was LUSITANIA, which was torpedoed. Reports to the bureau of navigation show that 26 vessels left American ports and required the use of wireless to summon help. Of that number four caught fire; 12 ran ashore, stranded or got into an ice jam; three broke down and five were in collisions.

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Progress on the New Welland Canal

Construction Work is Going Forward Steadily and Has Not Been Seriously Delayed on Account of the War

CONSTRUCTION work of the new Welland canal, connecting Lakes Erie and Ontario, has been followed with keen interest recently in both coast and lake marine circles. As pointed out in preceding issues of *The Marine Review*, the great demand for ocean tonnage has led coast operators to seek lake boats which can be adapted for ocean service. The present canal seriously limits the number of lake boats that can be transferred to the ocean and the comprehensive canalization plans of the Canadian government have assumed new importance to both ocean and lake operators in the last few months.

J. L. Weller, engineer in charge of building the new Welland canal, has furnished the following information, showing the present status of this project. Mr. Weller divides the work into four sections. He refers to section 1, as follows:

The new harbor at the Lake Ontario entrance to the canal is now well under way. The entrance channel is being formed by the construction of two earth embankments that will extend 1½ miles into the lake; these embankments have now reached a point about 5,000 feet from the shore line and contain approximately 1,800,000 cubic yards of material.

Fair progress is being made with dredging operations in the entrance channel, three dredges having been engaged at this work all last season, and the same number are at present employed, but owing to the hard nature of the underlying material progress is necessarily slow.

The reinforced concrete cribs that will form the substructure of the entrance piers at the end of the embankments are being built at Port Dalhousie, the entrance to the present canal, three miles west of Port Weller. These cribs are 110 feet long, 38 feet wide, and 34 feet high, and 53 of them will be required for the entrance piers and the docking in the harbor. One crib was constructed last season and three more have been completed so far this year. The contractors expect to build about 18 of these cribs during the present season.

The construction of the reinforced concrete retaining wall, which will extend along the west side of the harbor for 2,000 feet, is nearing completion. The contractors are at present engaged in building the west lock wall of lock No. 1, and concreting on this structure has been rapid during the past few months. The standard lock wall is a mass concrete structure 81 feet 6 inches in height and 46 feet wide at base.

The dry excavation on section No. 1 is practically completed, the material having all been disposed of in the east harbor fill. A good deal of the excavating plant has been rented to the contractors for section No. 2, who are disposing of their excavated material in the west harbor embankment, and a cross-over is at present being constructed to enable these contractors to dump on the east side of the harbor. The upper-entrance walls to lock No. 1 will be built upon a timber-pile foundation, the piles for which have all been driven.

Lock Breast Wall

The work on section No. 2 during the present season, outside of ordinary dry excavation, has consisted of the construction of the breast wall at the head of lock No. 2. The pit for this wall was taken down 69 feet to rock. The method of excavation adopted was to drive steel sheet piling to refusal and excavate material to the bottom of the piling, after which piling was re-driven and the material excavated to rock. Concreting on this wall is now up to ground level, and the remaining 6 feet will be completed soon. The upper entrance walls to lock No. 2 also will be built on a pile foundation, the piling for which has been driven and the seat prepared, and concreting in the west-entrance wall is now under way. The contractors for this section have removed approximately 2,500,000 cubic yards of earth excavation during the past year, the bulk of it being disposed of in the harbor embankments. The next structure to be started will be the breast wall of lock No. 3, and the method of construction will be similar to that employed at lock No. 2.

Some work has been done on the concrete protection to banks, this consisting of a 6-inch slab of concrete laid upon 8 inches of broken stone, and extending 5 feet below and 5 feet above the waterline, the base of this concrete protection resting on a 5-foot berm in the canal bank.

Section No. 3 comprises the flight locks Nos. 4, 5 and 6, in pairs, single lock No. 7, and two diversions of the Grand Trunk railway. These railway diversions have been completed, and the contractors are making good progress now with rock excavation on the site of the twin locks. This work involves the excavation of solid rock to a depth of approximately 80 feet for twin locks Nos. 4 and 5 and single lock No. 7. There are five steam shovels engaged in this work at present and a number of electric drilling machines, and material is being removed at the rate of about 75,000 cubic yards per month. All of the good rock excavated is being crushed for concrete, the contractors having been obliged, under their agreement, to erect a rock-crushing plant with a capacity of 4,000 tons per day. This plant has been in operation for some months, and stone for concrete is now being supplied to the contractors for sections Nos. 1 and 2. The dam at the head of lock No. 6 is progressing satisfactorily, two drag-line machines being engaged in re-handling material from storage piles, either side, into the dam, the material being compacted by steam rollers. The dam is now built up to a height of about 15 feet above the natural ground level. The upper west entrance wall to lock No. 6, which was started during the fall of 1914, has been completed. Pile-driving is now being carried on for the east entrance wall of lock No. 6, and concreting in this wall will be started within a short time.

Work on section No. 4, which consists of widening and deepening the present canal, is progressing rapidly, five steam shovels being employed in the dry excavation to widen the present canal banks, and to June 1, 1,250,000 cubic yards of material have been removed and disposed of on the low land to the west of the present canal. No further sections have been placed under contract to date. A construction railway to haul excavated material to the dump in the lake and crushed stone from the crushing plant on section 3 is completed, with interlocking and block signal system, telephone dispatching, etc., and is being operated at present to almost its full capacity.

Mr. Weller believes the $50,000,000 waterway will be ready to open in 1918. While the war has had the effect of delaying the letting of some of the contracts, in other particulars

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Work on Canal Slide

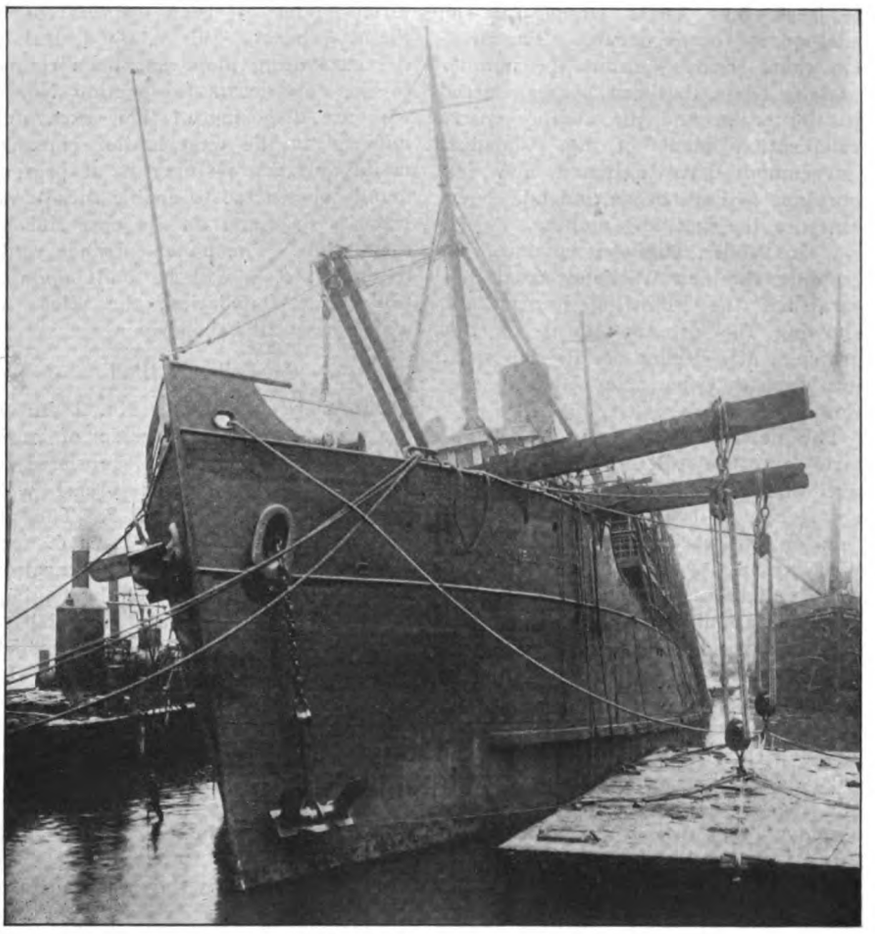
Although rapid progress is being made in clearing up the Panama canal, no estimate is obtainable as to the probable date of reopening the waterway. Most of the ships, originally held up by the slide, have been rerouted and shipping interests are meeting the emergency by using the Magellan route or by trans-shipping at the canal.

The Luckenbach line is maintaining practically almost its usual service between the Atlantic and Pacific coasts. Its vessels transfer cargo across the isthmus by means of the Panama railroad, and when traffic seems liable to become congested one or two ships are diverted to the Magellan route. Three of the line's ships are now at Cristobal and two are at Balboa. CAROLYN left Balboa recently to take a cargo of nitrates to New York, via Magellan, and FLORENCE LUCKENBACH left New York Nov. 27 for San Francisco by way of the long route. The Luckenbach ships now plying on the Atlantic side are JACOB LUCKENBACH, FLORENCE LUCKENBACH, LEWIS LUCKENBACH, J. L. LUCKENBACH and FREDERICK LUCKENBACH. Those on the Pacific at present are HARRY LUCKENBACH, HATTIE LUCKENBACH, PLEIADES, EDITH and CAROLYN.

Excavation at the slide on Nov. 22 amounted to 48,622 cubic yards for the 24-hour day, setting a new high record for a day's excavation in the cut. The total excavations for the last five weeks are 303,850; 239,885; 254,286; 256,262; and 294,698 cubic yards, respectively.

Raising Admiral Watson

One of the most difficult salvage jobs ever undertaken on the Pacific coast was recently successfully completed when ADMIRAL WATSON of the Admiral line was brought to the surface after being submerged for many weeks. As described in the November issue of *The Marine Review*, ADMIRAL WATSON was sunk at her moorings at the Bell street pier, Seattle, by the steamer PARAISO, Aug. 27. At low water the after end of the vessel was covered with 17 feet of water, with a pressure of 1,224 pounds to the square foot. Divers sealed the vessel from end to end. She was then braced with more than 1,000 interior shore timbers, varying in section from 4 x 4 inches to 8 x 8 inches, several divers being employed. Seven large pumps were set to work clearing the vessel's forward 'tween decks of water. The after main deck house was then pumped out, leaving the forward hold full. Four hours after the first pump had commenced work, the entire vessel had begun to lift, and ten hours from the inauguration of the work she had risen to the light load line. The ship was towed to the plant of the Seattle Construction & Dry Dock Co. for a dry docking and survey. Restoration of ADMIRAL WATSON to her former condition will probably consume three months. The accompanying illustration shows the ship immediately after being pumped out, methods of stabilization by means of barges and levers being illustrated.



BRINGING ADMIRAL WATSON TO THE SURFACE OF PUGET SOUND

Register Sunken Steamer

REPUBLIC, a freight vessel, has been admitted to permanent American registry under the act of Aug. 18, 1914, although she now rests on the bottom of the Pacific ocean. Back of the registration lies some interesting history growing out of the European war. REPUBLIC was formerly the German sea raider WALKURE and a companion of EMDEN, whose thrilling exploits as a rover over the oceans sinking merchantmen are still fresh.

WALKURE, now REPUBLIC, lies at the bottom of the ocean, at Papeete harbor, Tahiti islands, south of the Hawaiian islands, and is the first vessel that has been admitted to American registry while sunk. The vessel was captured by the French, who, after taking her into Papeete harbor, held her for a year, after which they opened the seacocks, allowing her to sink in 20 feet of water.

John A. Hooper, an American born citizen of San Francisco, purchased the prize from the French government, and now has a wrecking crew engaged in raising her. In the meantime he sought to place her under the American flag, and Acting Secretary of Commerce Edwin F. Sweet granted her provisional registry. Mr. Hooper expects to operate REPUBLIC out of San Francisco as a merchantman. REPUBLIC is 3,932 gross tons, was built in England in 1907 and is a steel steamer of the first class. Upon the breaking out of hostilities in Europe, the German government commandeered the ship and converted her into a raider.

The steamer TOLEDO, which has been operating out of Puget Sound ports, arrived at San Francisco recently from northern Pacific ports. The vessel will be placed under the Mexican flag and proceed down to Acapulco.

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Carthorses of Deep Sea Commerce

In All Winds and All Waters the Sturdy Ocean Tugs Bring Relief to Laboring and Crippled Vessels—Tug Crews Work Hard and Take Many Chances

By David A. Wasson

ONE of the most difficult towing feats on record was completed not long ago by the tug HERCULES of San Francisco, when she arrived at Balboa, Canal zone, with the largest caisson ever built in the United States. This caisson, constructed of steel by the Union Iron Works, San Francisco, for service in the Panama canal, was as unwieldly a craft as might be imagined, being 113 feet long and 61 feet deep, with a displacement of 2,000 tons. Small wonder that Captain Titchworth was forced to humor his strange consort all the way, or that HERCULES averaged but 4½ miles an hour during her 32 days at sea, and burned 3,000 barrels of oil on the 3,500-mile voyage. Such exploits direct attention to the remarkable efficiency of the modern steel ocean tug, an incarnation of energy and reliability.

When Tramps are Yachts

The cargo tramp has often been depicted as the hardest worker on the seven seas. As a matter of fact, she is a yacht in comparison with the ocean tug, one of the sturdiest and most powerful types afloat. At her best the tug costs $100,000 to build, and from wireless to submarine bells carries all the known safety appliances. Such virtues are requisites. Her business is the most hazardous in ocean commerce. The very nature of her calling, that of supplying motive power to vessels unable to help themselves, puts upon her a double responsibility.

While the tug is found wherever the lanes of commerce go, her element is the North Atlantic, one of the stormiest seas in the world. She takes any job she can get, but her principal occupation is that of towing strings of barges between the middle Atlantic coal ports and New England, traffic that costs more lives each winter than any other on the coast. Most of the barges are overloaded, some of them decrepit. Their emergency sail power is a joke. The crews pin all on their skipper's judgment, and he, poor man, is thus between two fires. His owners want him to maintain schedule time, regardless of weather. He is always haunted with the memory of brother skippers discharged for dawdling. His only good excuse for seeking shelter is afforded when he hears from his laboring consorts the well-known Consolidated code signal "I am leaking."

Even this warning does not always avail. A few months ago Captain Betts of CONCORD heard the ominous blasts from the coal barge DUNLO. He raced for Delaware breakwater, the barge's pumps working hard—and lost his race by ten minutes. The barge sank at the harbor mouth.

DAVID A. WASSON

David A. Wasson, author of the accompanying interesting article on deep sea towing, died at Colorado Springs, Colo., Aug. 9, 1915. Mr. Wasson, who was born Nov. 7, 1887, in West Meadford, Mass., was a frequent contributor to The Marine Review. His experience in shipping affairs was considerable, his greatest interest being in the merchant marine, and it was said that he knew practically every American ship on the Atlantic coast by sight. He contributed extensively to various journals, specializing on marine topics.

Even though the barges are tight, the tug's steel hawser unbreakable, and her engines undaunted, she has no guarantee of safety. Early in 1911, the big tug LYKENS was caught in a northeast gale off Cape Cod, with three coal laden barges. All were making good progress, inching ahead in the teeth of the weather, when the towing bitts pulled out of the first barge. Before the three could be recovered, they stranded on Peaked Hill bar. Hammering seas reduced them to splinters, and 17 men perished.

The Isthmian canal commission's tug RELIANCE, formerly M. E. SCULLY, of New York, had better luck with an unique and much more perilous tow. Just before the canal was opened, she took three barges from Christobal, on the Atlantic, through the straits of Magellan and up to Balboa, on the Pacific. Not a mishap occurred on this 10,000-mile trip, made in order to gain 50 miles as the crow flies. Later, entering the canal from Balboa, RELIANCE was the first vessel to circumnavigate South America.

Battered by Ice

The 785-ton naval tug POTOMAC recently won similar glory. Sent to Newfoundland to free ice bound American fishermen, she was abandoned after being caught in the ice herself, despite her 2,000 horsepower. After a winter in the pack POTOMAC was saved, none the worse for wear. Not one vessel in a thousand would have withstood such a crushing. Her survival was the marvel of maritime circles. POTOMAC had already won distinction by assisting two big naval auxiliaries in towing the huge drydock DEWEY from Hampton Roads, 15,000 miles to Manila. She was originally the merchant tug R. W. WILMOT, built at West Bay City, Mich.

Cases of bravery on the part of tug skippers are commoner than is ever known by the public, perhaps because of the comparatively obscure calling of these gallant little craft. Not long ago the three masted schooner FRED B. BALANO, loaded with granite, was caught in a winter gale and snowstorm, and anchored on a rocky lee shore off Portsmouth, N. H. In response to her distress signal the 85-ton tug M. MITCHELL DAVIS, Captain Hoyt, put out. Though the schooner was diving bows under and the tug's fire room was flooded constantly BALANO's anchors were weighed and she was taken in tow. Immediately the hawser parted, and the helpless schooner, her sails furled, began to drift toward the furious breakers a few hundred yards away. To all appearances she was doomed. But Captain Hoyt executed a manoeuvre worthy of

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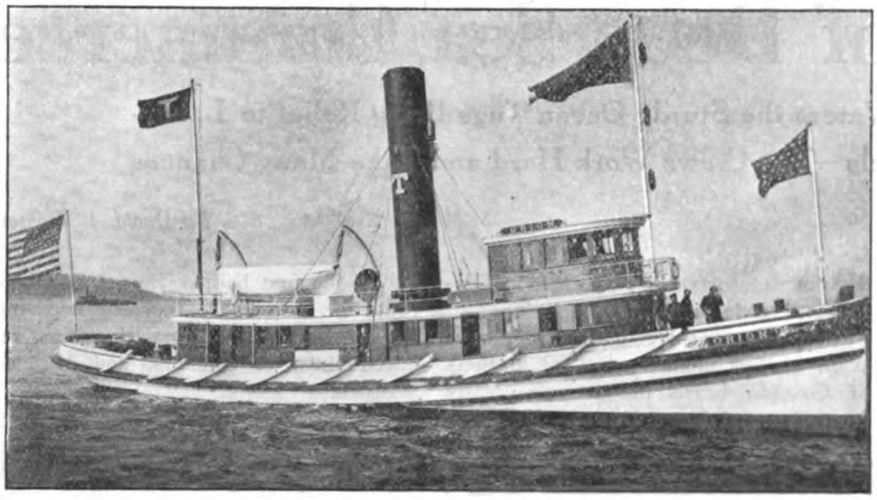


ORION, A STURDY COMMERCIAL TUG

a naval strategist, when he sent his tug almost into the surf and passed a new line to BALANO, taking her safe into Portsmouth.

The captain of the 52-year-old UNDERWRITER, of Boston, oldest sea going tug on the Atlantic coast, was no less plucky, but his efforts were ill-starred. The tug was towing the disabled four-mast schooner WESLEY M. OLER up the coast from Nassau to New York, when, on Dec. 9, 1902, they were caught in a terrible gale off Hatteras. OLER broke adrift, and though the tug made a desperate attempt to regain her, she stranded on the sands close aboard, and all hands were lost. The tug was compelled to put to sea to save herself, and for days was also given up for lost.

Such tasks as that of the 945-ton PAUL JONES of New London, largest tug afloat, will continue to inspire confidence. She recently left Norfolk with the heaviest tow that ever passed out of Hampton Roads. It comprised three of the largest barges yet built, loaded with 12,000 tons of coal.

As ships and cargoes grow greater in response to increasing commercial demands, so doubtless will the tug increase in size and strength to meet greater needs. And as long as the doctrine of the good Samaritan holds on sea as on land, deep sea sailors will honor the sturdy craft and hardy crews who bring them timely aid.

Oil Dispels Fog

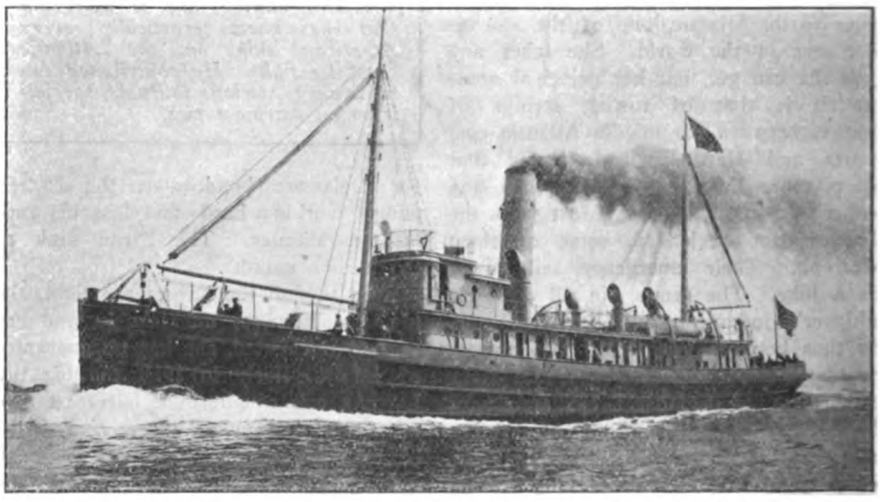
In response to a request made by the federal branch hydrographic office at New Orleans, for information concerning the reported possibility of dispelling fogs at sea by means of oil, Captain E. K. Roden, head of the nautical department of the International Correspondence Schools, Scranton, Pa., has submitted a personal experience which indicates the value of this practice to a fog-bound vessel. "A few years ago," writes Captain Roden, "while engaged as chief officer of the steamship TYRA, bound from Buenos Aires to Rosario de Santa Fe, Argentine republic, we ran into a heavy fog when in the neighborhood of San Pedro, a small town situated half way between Rosario and the mouth of the Parana river. The fog became so dense as to compel us to drop our anchor and await clear weather. While at anchor a part of the crew was engaged in stowing away glass demijohns of olive oil carried on the main deck. Through careless handling two of the demijohns were broken and their contents spilled on deck, the oil running out slowly through the scuppers on the port side. The rate of the current of the river at this point is about three knots, and as the oil was carried aft with the current it spread, producing a glossy avenue a hundred or more feet wide down the river in the wake of our ship. At the same time the oil had a remarkable effect on the fog. A distinct clearing in the fog bank became noticeable at once along that part of the river covered with the oil, and this continued until the last drop of the spilled oil had passed through the scuppers. So pronounced was the clearing produced by the oil that 'grass islands' drifting down with the current could be seen at a distance of a mile, while bunches of grass outside the oil zone were hidden from view when only a few yards away from the ship.

"Six months later the writer again had an opportunity to note the effect of oil on a fog bank. This time we were at anchor a mile outside of Magdalena, a resort southeast of Buenos Aires, in the mouth of the Plata. The fog was very dense and a boat was sent toward Magdalena with a dripping oil tank attached to its stern. A clearing was again noticed in the wake of the boat, but a strong wind blowing the fog across the course of the boat soon made the clearing less distinct.

"From this and subsequent experiments I have made on a small scale, it is my opinion that in calm weather good vegetable oil can be used to advantage in clearing a pathway or zone through a fog bank, provided the fog is caused by the evaporation of surface water. With a strong wind the effect is lost, except possibly in the direction in which the wind is blowing. The effect of wind, however, may be overcome, it seems, by distributing oil over a considerable portion of the sea.

"Enclosed waters like New York bay might be cleared of fog by having several distributing stations for oil and by taking advantage of tides in spreading the oil and thus minimizing the effect of wind.

"The value of oil as a preventive of fog is worth a thorough investigation, and I suggest that such an investigation be undertaken under the auspices and direction of the hydrographic office."



SONOMA, A TYPICAL U. S. NAVAL TUG

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On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Shipping News From Boston Bay

By George S. Hudson

ABOUT 2,000,000 bushels of grain have been booked for shipment to Europe during the next few weeks, and a fleet of chartered tramps is arriving to move the cereal. Several Greek ships are making the passage in ballast to help carry the wheat to Mediterranean ports, while the bulk of the freighters will clear for the channel. Rates on wheat average about 40 cents per bushel.

* * *

An addition to the coastwise coal carriers is the lake-built steamer JOHN G. MCCULLOUGH, registering 1,604 tons net and 1,895 tons gross. The vessel was formerly owned by the Erie railroad and has been refitted at Staten Island.

* * *

Big freight money will be earned by the six-masted schooners RUTH E. MERRILL and EDWARD B. WINSLOW and the five-masted SINGLETON PALMER, chartered to carry coal from Chesapeake bay ports to Rio Janeiro. Each vessel receives $8.50 per ton.

* * *

The steamers L. V. STODDARD, GEORGE HAWLEY and GEORGE E. WARREN will be equipped with tanks for transporting oil by their new owner, the Mexican Petroleum Co. The ships originally were owned by the Boston-Virginia Transportation Co.

* * *

Under charter for a period of nine months, at $19,000 per month, the Shawmut Steamship Co.'s steamer F. J. LISMAN is now in the trade between New York and the West Indies.

* * *

The sailing ship TIMANDRA, Captain Gilkey, will load a cargo of 1,500,000 feet of lumber at Boston for River Plate ports, the rate being approximately $20 per 1,000 feet.

* * *

The Eastern Steamship Co.'s steamer, Gov. COBB, has been chartered to run for the winter between Key West and Havana.

* * *

W. B. Johnson, Boston, has sold the steamship CAROLYN to the Harty Steamship Co., New York, for $197,000. Mr. Johnson purchased CAROLYN after she had pounded many months on the coast of Maine, floated her and made extensive repairs to the hull. The ship has made several foreign voyages which netted a larger amount than cost of repairs and the proceeds from CAROLYN's sale may be regarded as clear profit.

* * *

A new service between Texas and Boston has been inaugurated by the Southern Pacific railroad, the first direct arrival being the steamship EL MONTE, Capt. Pinchin, which brought about 100 carloads of canned goods originating on the Pacific coast.

* * *

C. H. W. Foster, the Boston yachtsman, is building a big vessel at Essex, Mass., to demonstrate that the ketch rig is better in the fishing industry than that of a schooner. The craft will have a powerful motor with an auxiliary motor for hoisting sails and anchor. Mr. Foster, it will be recalled, founded at Marblehead, Mass., a school of seamanship for the young men of that port.

* * *

The 53-year old schooner FRANCONIA, damaged last August by the Clyde line steamer ONONDAGA, has been rebuilt and returns to the coasting trade in charge of Capt. Mitchell.

* * *

Pensacola, Fla., pilots have purchased the two-masted schooner SHEPHERDESS, built by Oxner & Story at Essex, Mass., in 1905, and will use her in their service. The vessel is 110 feet long, 82 feet waterline, 22.6 feet beam, 12 feet depth of hold and is equipped with a motor.

* * *

Captain W. P. Brocklebank has purchased the two-masted schooner EDWARD S. EVELETH, built at Essex, Mass., in 1893, and will use the vessel in carrying sand from North Shore ports.

* * *

Steamers of the Eastern Steamship Corporation are using the Cape Cod canal quite frequently in the New York service, effecting a saving in steaming time of several hours.

* * *

The first full cargo of refined sugar ever shipped from Boston to Europe was taken to Liverpool the latter part of last month in the British steamship POLRUAN, Capt. Jeffrey. The shipment weighed about 4,500 tons and was owned by the British government, it is reported.

* * *

Extensive repairs to the British steamship ESKASONI are being made at Simpson's dry dock, East Boston, the work including a new propeller shaft, several new plates and overhauling of ballast tanks and engine.

On Chesapeake Bay

By Hollis F. Bennett

THE schooner WALTHAM, Captain Werner, was denied clearance at the Baltimore custom house recently. Captain Werner shipped four men in New York, but, as none of them had certificates as able-bodied seamen, Collector of Customs Ryan refused the vessel clearance. The four men were examined at the Custom House and three passed the examination. WALTHAM was delayed two days. She is loaded with coal, bound for Cienfuegos.

* * *

Captain Wm. J. Quillen has chartered his schooner LAURA C. ANDERSON to load case oil at New York for a French Mediterranean port for the reported sum of $22,500. LAURA C. ANDERSON is a four-masted schooner, 183 feet long, and has a gross tonnage of 960 tons.

* * *

The Ellicott Machine Corporation has laid keels for three tugs for the Pennsylvania railroad. These tugs are for use in New York harbor and are of the following dimensions: Length over all, 105 feet; length between perpendiculars, 91 feet 3 inches; beam, molded, 24 feet; depth, 12 feet, 2 inches. Each boat is fitted with a fore and aft inverted compound engine of standard Pennsylvania railroad design, with cylinders 18 x 38 inches and 26-inch stroke, and one Babcock & Wilcox boiler.

* * *

The Castle Line steamship YORK CASTLE, Captain Jackson, recently arrived in port from Natal-Delagoa bay and Cape Town with a cargo valued at approximately $1,000,000. The cargo comprised 6,000 tons of nickel ore, copper, wool and 204 cases of ostrich feathers.

* * *

The steamer ONTARIO of the Merchants & Miners line, which broke her high pressure cylinder in Vineyard Sound recently, was repaired at the Atlantic Works. The ship was bound from Baltimore for Boston, her passengers being transferred to NANTUCKET belonging to the same company.

* * *

The Merchants & Miners Transportation Co. has sold its old steamship FREDERICK to New York interests, who have formed the Frederick Steamship Co. It is reported that FREDERICK will be used to transport automobiles from New York to Archangel. She was one of three iron steamships built by the Pusey & Jones Co., Wilmington, Del.,

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in the year 1874, for the New Orleans service of the Cromwell line. These three ships, built as KNICKERBOCKER, NEW ORLEANS and HUDSON, ran for a number of years on this line. The last two were sold some years ago to the Merchants & Miners Co., who changed HUDSON's name to FREDERICK.

The Baltimore Dry Docks & Ship Building Co. is converting FREDERICK from a passenger steamer to a freighter. The long cabin on the main deck has been entirely cut away except for enclosures in way of boiler and engine hatches, and under the pilot house. A new stack and two new 5-ton cargo booms have been fitted. The long tapering topmasts have been removed and the mastheads tapered up to take signal halyard trucks. When the ship was drydocked, her iron hull, after 41 years of service, was found in excellent condition. FREDERICK is 287 feet long, 34-foot beam, 23-foot molded depth and of 1,872 tons gross register. Captain Herman Kiehne, of Baltimore, who was in command of the American sailing ship WILLIAM P. FRYE, when she was sunk by the German raider EITEL FRIEDRICH, will command her.

* * *

The Baltimore Dry Docks & Ship Building Co. has finished its new shipways and also its overhead crane installation. These ways will accommodate two 300-foot ships. The American Bridge Co. built the overhead crane way and the Brown Hoist Co. furnished the crane. The ways were built from the Baltimore company's designs.

Puget Sound Notes

By F. K. Haskell

THE steel freighters RUTLAND and OGDENSBURG, recently purchased from Great Lakes interests by the Pacific Alaska Navigation Co., will be renamed ADMIRAL CLARK and ADMIRAL SEBREE, and will be operated between Puget sound and Alaska. The vessels are sister ships of 2,300 tons gross.

* * *

Carrying nearly 20,000 tons of cargo, the greatest fleet ever sent from Puget sound to the west coast of South America in one month by W. R. Grace & Co., departed from Seattle, Tacoma and Port Angeles, during November. The fleet consisted of six steam freighters and three sailing vessels. Flour, wheat, canned salmon and lumber formed the major shipments. The fleet took 5,600 tons of wheat; 7,000 tons of flour and 4,000,000 feet of lumber, besides explosives, merchandise and general freight. The November record is due entirely to the success of Grace & Co. in providing carriers for the route. A great demand exists for Puget sound and northwest products in the Pacific coast republics of South America. The nine vessels included the steamship CUZCO, the steam schooners FALCON, NAN SMITH, ST. HELENS, ALVARADO and GEORGE W. FENWICK, the Peruvian schooner STELLA and American schooner CAMANO.

* * *

The famous power schooner RUBY is now at Port Angeles, Wash., for repairs. RUBY added to her fame last summer when she carried the news from Herschel island to Nome that Vilhjalmar Stefansson, the lost Arctic explorer, was alive. RUBY is commanded by Capt. S. F. Cottle, famous Arctic whaling master.

Around the Golden Gate

By A. A. Willoughby

IRMGARD, which left San Francisco for the far east recently, is the first sailing vessel to clear for Manila in many years. She carried a full cargo below decks and a deckload of lumber. There is a great deal of congestion of freight destined to and from the Philippines since the withdrawal of the Pacific Mail and it is likely that a number of windjammers will be pressed into service shortly.

* * *

According to announcement by Hind, Rolph & Co., agents for the Union Line, a new fortnightly freight service to Australia will be inaugurated early in 1916. The company has previously operated four freighters to this port at irregular intervals and these with the two additions, WAITOMO and WAIKAWA, will make up the fleet. The former boat has been in the Sydney-India run and the latter in the New Zealand-London service.

* * *

A new Central American service has been inaugurated by W. R. Grace & Co., beginning with the sailing of MELVILLE DOLLAR for Champerico, San Salvador. COLUMBIA, ST. HELENS and ALVARADO will follow in January. The service will be fortnightly and will be in competition with the present Pacific Mail service.

* * *

Announcement of the new Java-Pacific line which is to open a freight service between San Francisco and Oriental ports after the first of the year, has previously been made in these columns. J. D. Spreckels & Bros. have been appointed the Pacific coast agents and Fred F. Connor, traffic manager. ARAKAN is due to arrive in February, TJIKEMBANG in March, KARIMOEN in April and TJISONDARI in May. Each of the boats has a carrying capacity of 8,000 tons.

* * *

The first Japanese steamer to be chartered for the South American trade from San Francisco, is NICHIYO MARU, under charter to W. R. Grace & Co.

* * *

There are being constructed in eastern shipyards for service out of this port, three freighters for the Luckenbach Steamship Co., two freighters for the American-Hawaiian Co., three tankers for the Shell Oil Co. and four freighters and one passenger and freight boat for W. R. Grace & Co.

* * *

The Union Iron Works has at the present time more contracts and work under way than at any time during the past 15 years. In addition to the eight boats mentioned in the last issue, two oil tankers were since contracted for by the Atlantic Gulf Refining Co., one of the Standard Oil subsidiaries. The cost will be $950,000 each. More than $1,000,000 is to be spent in enlarging the plant to accommodate the increase of business. Five new sets of ways are to be constructed as well as a new floating dry dock at Hunter's Point, and the drydock mentioned previously. The present dock at Hunter's Point, which is 450 feet long, will figure in the construction of the new dock. A new record was hung up in the construction of the Union oil tanker LA BREA. Three months elapsed between the laying of the plates to the launching. The time heretofore has been four to five months.

* * *

The steamship SIERRA of the Oceanic line was given her trial trip Nov. 30, following extensive alterations and repairs. The boilers were rearranged, engines overhauled and the fuel oil tank capacity largely increased. The repair costs totaled $180,000. She is now in the same condition as her sister boats SONOMA and VENTURA and will go into service between this port and Australia.

* * *

The steamer GREAT NORTHERN which has been plying between this port and Flavel in conjunction with NORTHERN PACIFIC, from now on will make the triangle trip between San Francisco, Honolulu and San Pedro. NORTHERN PACIFIC will handle the north coast business alone. This schedule will be maintained throughout the winter.

* * *

A new departure has been inaugurated in the use of ships of the Alaskan fishing fleet as carriers during the idle season. STAR OF HOLLAND left last month for Portland to load lumber for Australia and it is likely that others of the fleet will follow suit, due to the high charter rates prevailing. Previously, these boats laid up in Oakland creek for six months of the year. By the new method, they can leave here after the pack is brought in, make the trip to Australia or the south seas, and return in time for the following fishing season.

* * *

The chartering of CHEHALIS to raise the sunken WALKURE in the harbor of Papeete, brings to light an interesting and remunerative venture launched less than a year ago. A company in which Sudden & Christensen and John A. Hooper are the largest shareholders, was formed to buy the old Pacific Mailer ALGOA for $200,000. The boat, renamed CALIFORNIA, was chartered to the Du Pont Powder Co. at a rate which has netted the company in excess of $1,000 a day since and has repaid the purchase price. The steamer MAZATLAN, which recently ran afoul of the government, has been purchased by this company and WALKURE will be put in service as soon as raised and repaired. The expedition on CHEHALIS is in charge of Capt. L. Curtis, of the board of marine underwriters, accompanied by numerous engineers, salvage experts, divers and mechanics.

* * *

Wire dragging in locating pinnacle rocks which are a menace to navigation will doubtless be used to some extent on the Pacific coast in the near future. KING AND WINGE, which has been charting submerged rocks off southwestern Alaska the past

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summer, is headed down the coast and if the congressional appropriation holds out, will likely carry out some work near here.

* * *

The small coaster SISKIYOU is making what is considered a remarkable cruise for such a small boat. She left San Pedro in July for Balboa, thence to Bluefields, Gulfport and New Orleans, logging on the trip nearly 5,400 miles by the time New Orleans is reached. The steamer is owned and operated by the E. K. Wood Lumber Co., and captained by J. H. Hansen.

* * *

The Mitre line made its entry to local shipping circles with the arrival of the steamer PURLEY, bound from Vancouver to Avonmouth.

* * *

Lumber and grain carriers are continuing in brisk demand at exceedingly high charter rates. Lumber rates to Australian and South African ports are well around the 100 shilling mark to the former and as high as 142 shillings to the latter. Every available vessel is being rushed into service.

* * *

The Norwegian steamer TANCRED has been chartered by the Western Fuel Co. to carry coal between British Columbia and this port. She will go into service the coming spring.

In New York Harbor

By George Nicholson

THE Staten Island Ship Building Co. has just completed the installation of a four-cylinder direct reversible Bolinders fuel oil, 320-horsepower engine in Standard Oil barge No. 62.

* * *

The extreme shortage of tonnage seriously restricts chartering as orders are numerous in several trades and rates are at the highest point reached in years. Quotations to Liverpool, London and Hull, 20d; Rotterdam, 37½ pfennings; cotton to Liverpool, per 100 pounds, $1.25.

* * *

The steamer PROSPERPINE, which was wrecked at Sandy Hook about three years ago, having been run ashore while the vessel was afire, was recently raised by the Merritt & Chapman Co. and is now being entirely rebuilt at the Tietjen & Lang Dry Dock Co.'s yards at Hoboken, N. J.

* * *

The work of converting the steamer OSWEGO, formerly operating on the Great Lakes into an Atlantic coast steam schooner is being done by the Staten Island Ship Building Co.

Delaware Note

WHITE WINGS, a schooner formerly owned by David Baird, spar builder, Camden, N. J., is to be placed under the Portuguese flag. She was originally a barkentine and was built by William E. Woodall & Co. She was one of the famous copper clipper-ships in the trade between United States and Brazil. When this trade declined, she was taken over by Mr. Baird. Her new owner, Morean Limtoda, a merchant of Lisbon, paid $17,000. She is 168 feet over all and has a tonnage of 648.

New Orleans and Gulf

By Harry H. Dunn

SEVENTEEN miles of levees and revetments, destroyed by the storm and high water of Sept. 29, along the "lower coast" of the Mississippi river, with a loss of $1,200,000, will be replaced, according to the decision of the Mississippi river commission, which held hearings in New Orleans and in Buras, a town in the damaged section, recently.

* * *

Winter sailings of the steamer SYDNEY between New Orleans and St. Louis will be resumed Jan. 3, according to announcement by Captain Roy Streckfus.

* * *

Constant work by one of the big dipper dredges of the Jahncke Navigation Co. for nearly a month, has practically resulted in the rescue of the big steel passenger steamer HANOVER from a point 3,000 feet inland from Lake Ponchartrain, where she was blown high and dry by the storm of Sept. 29. HANOVER landed right side up on dry land, about seven miles west of West End, on the lake. The Navigation company has dug a channel, nearly 4,000 feet long, 60 feet wide and 15 feet deep, from deep water in Lake Pontchartrain, to the bow of HANOVER. Then a basin, 60 feet wide and 15 to 20 feet deep, was dredged all around the steamer, leaving her perched on an island smaller than the bottom of her hull. The dipper dredge was removed and now a suction machine has been put at work at the vessel's stern, pumping the island from under her. The work, when completed, will cost about $10,000. HANOVER is an all-steel craft, used for excursions on the river and on the lake.

* * *

The recent eleventh annual convention of the Inland Waterways League of Louisiana and Texas, at Houston, put itself on record as favoring a 9-foot channel, with a width of 100 feet, instead of the 5-foot channel, previously advocated.

* * *

The big excursion steamer MAJESTIC, of the Lee Line, arrived in New Orleans, ready to open the season, Dec. 1. She is 240 feet long, with an 8-foot hold, and carries five decks for passengers.

* * *

Contract for the raising of the Portuguese bark, SANTOS ALMIRAL, sunk in front of the government dock at New Orleans during the September hurricane, has been awarded to B. D. Wood & Bro., New Orleans, for $7,985. When salvaged, the bark will be turned over to Nathan & Stern, of the Stern Foundry & Machine Co., for a consideration of $8,000. Mr. Stern will enter her under the American flag. He had previously chartered her for $20,000 for one voyage.

* * *

Alexandria and Shreveport, La., business interests have organized the Red River Transportation Co. to revive steamer lines on the stream of that name, and to oppose discontinuance by the war department of appropriations for navigation on the river. Dr. W. D. Haas, president; A. T. Felt, secretary, and J. L. Pitts, director, of the Alexandria chamber of commerce, have gone to Shreveport to confer with United States engineers as to whether the government will continue to aid navigation on Red river.

* * *

St. Louis business men and shippers have pledged 150,000 tons of freight for the new line of self-propelled barges soon to be in operation between the Missouri port and New Orleans.

* * *

Steamer men on the river are fighting the proposed reduction to a barge line basis of freight rates on sugar and molasses, which has been asked of the Louisiana state railroad commission by Capt. J. E. Comeaux, Capt. H. M. Carter, of the Carter Packet Co., and Capt. Charles W. Brown, traffic manager of the Steamboat Traffic Association, went to Baton Rouge late in October to protest the reduction. Present river rates are 65 cents per barrel on molasses and 10 cents a hundredweight, about 35 cents per barrel, on sugar, the routes covered being between Bayou Sara and intermediate points and New Orleans. The new rates sought by the barge men are 40 cents per barrel on molasses and 25 cents per barrel on sugar.

* * *

The United Fruit Co. and other lines sailing from New Orleans have replaced their Chinese firemen with English-speaking stokers. In only a few instances have ships been unable to secure the required 75 per cent of English-speaking crews.

* * *

Miami, Fla., is having plans prepared for a ship channel for which the city has voted $300,000 bonds.

* * *

The Hamburg-American line has sold the steamer HOUSATONIC, interned in New Orleans since the beginning of the war, to the Housatonic Steamship Co., New York. The steamer formerly was GEORGIA, but will now fly the American flag. Edward F. Geers, president of the Housatonic company, conducted the negotiations which resulted in the sale. The price paid is reported in New Orleans shipping circles to have been $85,000. Immediately after the sale, Mr. Geers came to New Orleans, changed the name of the ship and entered her under American registry. HOUSATONIC was built in 1891. She is 329.8 feet long, with a beam of 41.6 feet. During the recent hurricane she was slightly damaged and is being repaired as rapidly as possible.

* * *

The steam packet AMERICA, operating in the upper coast trade to Vicksburg, Lake Providence, the Bends, Carriola and intermediate landings, broke the records for rice shipments Nov. 3 when she brought 6,779 sacks of rice to New Orleans.

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Red Hot Tips From the Trade

Pertinent Suggestions and Personal Gossip

A NUMBER of prominent naval and ship building officials recently witnessed a test of a new refrigerating machine manufactured by the Westinghouse Machine Co., East Pittsburgh, Pa. This machine was designed by Maurice Le Blanc, originator of the Le Blanc condenser, and is being marketed by the Westinghouse company.

A particular feature of the machine is the absence of all chemicals or compressed gases, such as carbon dioxide, ammonia, or sulphur dioxide. Among other advantages claimed for the machine, are small space and light weight, simplicity and efficiency of operation, and the fact that the cooling of the water or liquid is accomplished in the machine itself without the use of a cooler.

Among those who witnessed the test were: Commander M. E. Reed, bureau of steam engineering United States navy, Pittsburgh; Commander Dodge, inspector hull materials, Munhall, Pa.; H. A. Magoon, vice president, New York Ship Building Co., Camden, N. J.; Homer L. Ferguson, president, and Charles F. Bailey, chief engineer, Newport News Ship Building & Dry Dock Co., Newport News, Va.; L. K. Lovekin, chief engineer, New York Ship Building Co., Camden, N. J.; Lieut. H. A. Stuart, United States navy, acting head of experiment station, Annapolis, Md.; H. M. Phillips, inspector, United States government, Pittsburgh; Eric Bennett, Lloyds Register of Shipping, Pittsburgh, and Westinghouse officials.

Storage Battery Bulletin

On account of the increasing use of storage batteries for marine service, considerable interest is attached to a bulletin recently issued by the Roller-Smith Co., 203 Broadway, New York, describing its line of voltmeters and ammeters specially designed for storage battery work. Battery troubles, it is stated in the bulletin, can in nearly all cases be traced to one or more of three causes: Overcharging, undercharging or overdischarging. The battery maker gives explicit instructions that the battery be charged a certain number of hours, starting in at a certain ampere rate and finishing off at another ampere rate; it is emphasized that this must be done whenever the voltmeter shows that the battery needs charging and the battery user is warned particularly against discharging the battery at a higher ampere rate than a certain specified value or beyond the point where the voltmeter shows that the battery is run down.

To Save Life

A 28-page booklet published by the Robison-Roders Co., Newark, N. J., describes life saving equipment, including safety mattresses, pillows, life preservers, swimming floats, cushions and ring buoys. A special fiber is employed, which is said to combine great durability and buoyancy. Numerous illustrations show the equipment in use.

Bolinders Busy

The Bolinders Co., 30 Church street, New York, has recently sold 20 engines of various sizes, ranging from 160 to 320 brake horsepower, including a lot of six 320 horsepower, four-cylinder engines for the Smith Shipping Co. Since its establishment the New York office of the Bolinders Co. has taken orders for a total of 110 engines, aggregating 8,254 brake horsepower.

Book Reviews

The Year Book of Wireless Telegraphy and Telephony, published by the Marconi Publishing Corporation; 800 pages with map, furnished by *The Marine Review* for $5.00 net.

The 1915 edition of this year book marks the third successive year that it has been published. Some changes have been made in the subjects discussed in order to make the book more representative of the field which it covers. This year book is designed to provide a complete work of reference to wireless telegraphy and telephony. This subject is necessarily so broad that a large number of pages are required to properly present the data which must be given. However, a successful effort has been made to keep the book as small as consistent with a thorough covering of the field. Less than 40 pages have been added to the number presented in the 1914 issue, although the number of subjects dealt with have been increased and some of the information revised and amplified. Among the new subjects presented, are articles on "Wireless and War at Sea", "The Influence of Wireless Telegraphy on Modern Strategy" and "Wireless Telephony". These subjects are of very timely interest and are covered in a thorough and authoritative manner. Among the more important subjects presented the development of wireless telegraphy, international radiotelegraphic convention, safety of life at sea, laws and regulations of all the nations of the world, a complete list of land and ship stations, call letters, international time and weather signals, useful formulas and equations, glossary of terms, dictionary of technical terms, and a large number of tables. Particulars of the leading companies engaged in the commercial development of wireless telegraphy also are presented, together with a bibliography of wireless telegraphy and telephony. The book includes a directory of the various wireless societies and illustrated examples of international code signals.

Marine and Stationary Diesel Engines, published by Spon & Chamberlain, New York; 199 pages; numerous illustrations and charts; furnished by *The Marine Review* for $3.00 net.

This book is essentially a practical treatise on diesel engines. It is designed to satisfy the need for a practical work in concise form, giving all the information available regarding the various types and designs of this engine. The field for such a book is clearly indicated by the prominence which has been attained by the diesel engine, both stationary and marine, all over the world. The book will prove of value to the consulting engineer, the draftsman, to those who are investigating the subject, and to those who propose to install engines. The book contains a discussion on marine engines, together with technical descriptions of the many different types of horizontal, vertical, slow speed and high speed, marine and stationary engines, and draws attention particularly to special features in the construction of these types, which will prove of value both to the technical and non-technical reader. The work is well illustrated and contains drawings photographs and sectional views of nearly all of the diesel engines made.

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Superior Ship Building Co.

DROPS—(Wharf.)
American Engineering Co.

DRY DOCKS.
American Ship Building Co.
Baltimore Dry Dock & Ship Bldg. Co.
Chicago Ship Building Co.
Collingwood Ship Building Co.
Detroit Ship Building Co.
Great Lakes Engineering Works
Kennedy Valve Mfg. Co.
Manitowoc Ship Bldg. & Dry Dock Co.
Milwaukee Dry Dock Co.
Seattle Construction and Dry Dock Co.
Superior Ship Building Co.
Tietjen & Lang Dry Dock Co.
Toledo Ship Building Co.

DYNAMOS.
General Electric Co.

EJECTORS.
Penberthy Injector Co.

EJECTORS.—(Ash.)
Great Lakes Engineering Works

ENAMELS.
Patterson-Sargeant Co.

ENGINEERS.—(Marine, Mechanical and Consulting.)
Babcock & Penton
Donnelly, Wm. T.
Farley, Edward P., Co.
Furstenau, M. C.
Grissom Russel, The, Co.
Hynd, Alexander
Seattle Const. & Dry Dock Co.

ENGINEER'S SPECIALTIES
Penberthy Injector Co.
Ross Valve Mfg. Co.

ENGINES.
American Engineering Co.
American Ship Building Co.
Bookwalter Co.
Chase Machine Co.
Seattle Construction & Dry Dock Co.
Southwark Fdy. & Mch. Co.
Superior Iron Works

ENGINES.—(Diesel Principle.)
Southwark Fdy. & Mch. Co.

ENGINES.—(Hoisting.)
American Blower Co.
American Engineering Co.
Chase Machine Co.
Hyde Windlass Co.
Lidgerwood Mfg. Co.
Superior Iron Works

ENGINES.—(Marine.)
American Blower Co.
American Ship Building Co.
Bath Iron Works
Bookwalter Co.
Chase Machine Co.
Chicago Ship Building Co.
Collingwood Ship Building Co.
Detroit Ship Building Co.
Fletcher, W. A., Co.
Fore River Ship Building Corp.
Great Lakes Engineering Works
Johnston Bros.
Lidgerwood Mfg. Co.
Manitowoc Ship Bldg. & Dry Dock Co.
Milwaukee Dry Dock Co.
Sheriffs Mfg. Co.
Southwark Fdy. & Mch. Co.
Superior Ship Building Co.
Toledo Ship Building Co.
Trout, H. G.

ENGINES.—(Mooring.)
American Engineering Co.
Chase Machine Co.
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ENGINES.—(Steering.)
American Engineering Co.
Hyde Windlass Co.
Lidgerwood Mfg. Co.

See Index to Advertisements for pages containing advertisements of companies listed above

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The Superior Ship Building Company

SUPERIOR, WISCONSIN

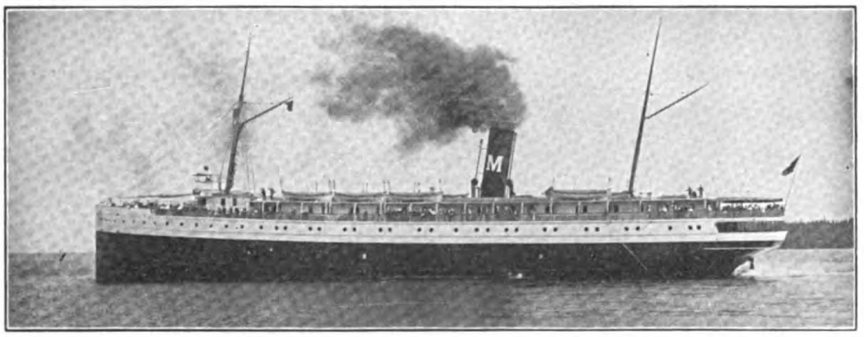
SHIP AND ENGINE BUILDERS

Dry Dock and Repairs of all kinds

Large stock of material always on hand for Repairing Wooden and Metal Ships

REPAIRING promptly attended to Night or Day

Chicago Ship Building Company



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Passenger or Freight—Any Size

Yards, Dry Docks and Repair Shops at South Chicago, Ill.

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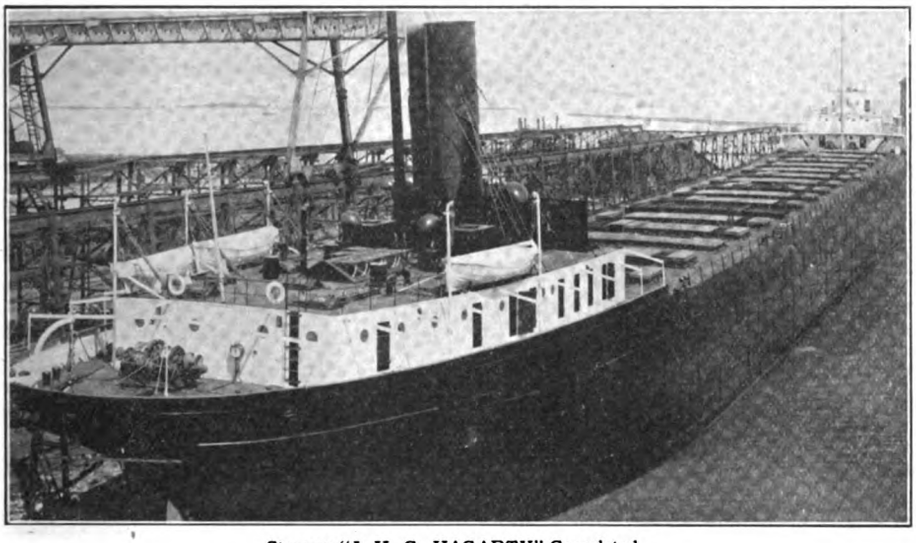
LIMITED

COLLINGWOOD—ONTARIO—CANADA

STEEL and WOODEN SHIPS, ENGINES, BOILERS, CASTINGS and FORGINGS

PLANT FITTED WITH MODERN APPLIANCES FOR QUICK WORK



Steamer "J. H. G. HAGARTY" Completed

DRY DOCKS and SHOPS

EQUIPPED TO OPERATE

DAY or NIGHT on REPAIRS

Milwaukee Dry Dock Company

MILWAUKEE **WISCONSIN**

SHIP REPAIRS
OF ALL KINDS

We have two ship yards offering every facility for the repair of both steel and wooden vessels. South Yard Dock is 450 ft. long on keel blocks; 460 ft. over all; 60 ft. width of gate and 16 ft. over sill. West Yard Dock is 312 ft. on keel blocks; 45 ft. width of gate and 12 ft. over sill. Rudder pit in each dock. Electric light for night work.

MAIN OFFICE AT SOUTH YARD

Foot of Washington Street

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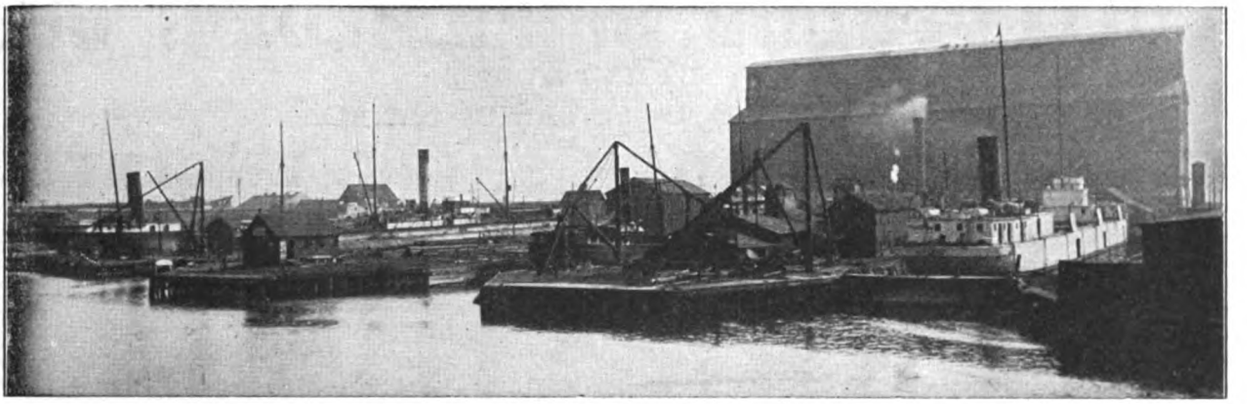

The Buffalo Dry Dock Company

BUFFALO, N. Y.

With our excellent equipment we are enabled to do all kinds of ship repairs at reasonable cost to the owners, whose patronage is solicited with the guarantee of satisfaction in all particulars.

We call attention to our facilities for the construction of new vessels of all kinds, particularly dredging outfits, tugs, scows, fuel lighters, etc., plans for which we will furnish on application together with specifications and estimates of cost.

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Office Telephone, Bell, 4055 Seneca: 515 Frontier. President's Office Telephone, 2329 Seneca.
President's Residence Telephone, Tupper 3012 Ass't Sec'y's Telephone, 324 North
Superintendent's Telephone, Bryant 209. Tupper 3012

Tietjen & Lang Dry Dock Co.

HOBOKEN, N. J.

NINE DRY DOCKS

600, 800, 1,000, 1,200, 1,400, 1,800, 2,000,
6,000, 10,000 TONS

General Repairs on Wooden and Iron Vessels

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Completely Equipped Shops for Ship, Engine and Boiler

REPAIRS

Ship Builders, Engine Builders, Boiler Makers, Iron Founders, Brass Founders, Lumber Manufacturers

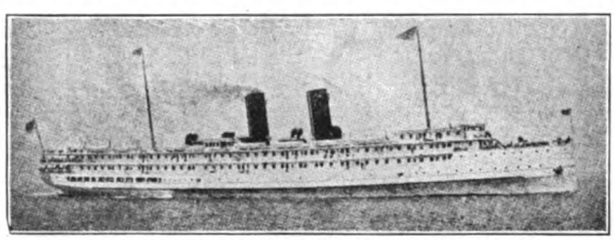
PARSONS' MARINE STEAM TURBINES—YARROW BOILERS

Cable Address: "THREEDOCKS"—Codes: Western Union, A. B. C., 5th ed. and Bentley's

Seattle Construction & Dry Dock Company

SEATTLE, WASHINGTON

PARSON'S MARINE TURBINES



TURBINE STEAMSHIPS YALE AND HARVARD

Marine Engines, Boilers and Machinery of All Kinds

Contractors for Vessels Complete

W. & A. FLETCHER COMPANY, Hoboken, N. J.

BATH IRON WORKS

LIMITED

BATH, MAINE

Shipbuilders and Engineers

Licensee for Parson's Marine Turbines, Normand Express Water Tube Boilers.

Particular Attention Given to High Speed Requirements Estimates Furnished.

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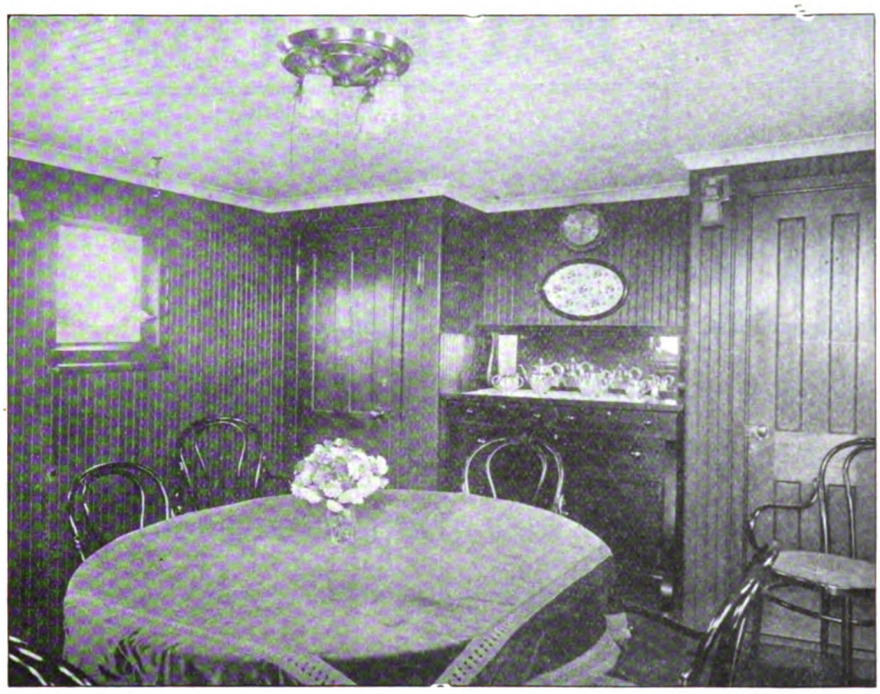
BYERLYTE DECK FLOORING

The only successful composition flooring for ships



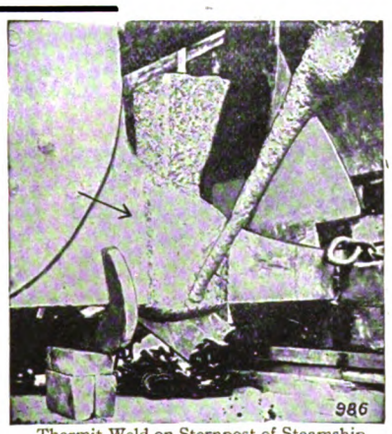
Diningroom of the Steamer Underwood of the Erie Railroad Lake Line covered with Byerlyte

Vessel owners are recognizing the wonderful adaptability of Byerlyte deck flooring for ships. It absolutely will not crack; it binds perfectly with either wood or steel; it is waterproof, fireproof and vermin-proof; it is entirely mineral, is indestructible and will wear forever.

Vibration cannot break its surface

BYERLEY & SONS
CLEVELAND

Estimates given on request



Thermit Weld on Sternpost of Steamship "William Henry Mack"

Quick Marine Repairs

Thermit Welding is quick, easy and effective—and when applied to broken rudder frames, sternposts, or sternframes, will enable your **vessel to return to service in two or three days,** effecting a tremendous saving in dry dock charges.

There is nothing experimental about Thermit Welding. During the last few years we have executed many repairs for the principal steamship companies of the Atlantic and Pacific coasts and the Great Lakes and every repair has been uniformly successful and our best advertisement.

Our process is sanctioned by the British Corporation for the Survey and Registry of Shipping, Glasgow.

☞ If you are interested obtain our pamphlet No. 3440 and Reactions, which illustrate and describe many marine repairs and contain full information about the process. Every marine man should have one.

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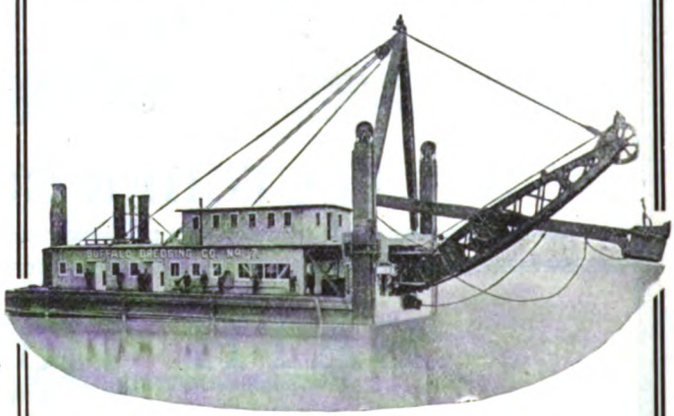
MODERN MARINE BOILERS
and
STEEL SHIP BUILDING



TUGS, PASSENGER STEAMERS and SPECIAL CONSTRUCTION

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JOHNSTON BROTHERS
FERRYSBURG, MICHIGAN

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Reinforce Your LEAD AND ZINC with Pure, Smooth, Fine, White, Soft

SILICA

A combination zinc of this character prevents cracking and brittleness. Our Pure Water Floated Silica is so finely ground it is as smooth as pure zinc itself. Its softness prevents wearing on paint mills. Write for sample.

—But Don't Expect *Best Protection* from a paint containing free silica. There are many graphite paints but there is only one paint with a pigment of "silica-graphite." Nature has provided

DIXON'S SILICA GRAPHITE PAINT

with a pigment unlike that of any other. The fine particles of silica and the thin flakes of graphite are so intimately associated that mixed with pure boiled linseed oil, it does not settle into a hard mass. More important, though, is the even distribution of oil and pigment and therefore the *longest service* protection. Get detailed information concerning your paint requirements. Write for booklet No. 77-B to the

JOSEPH DIXON CRUCIBLE COMPANY
Jersey City, N. J.

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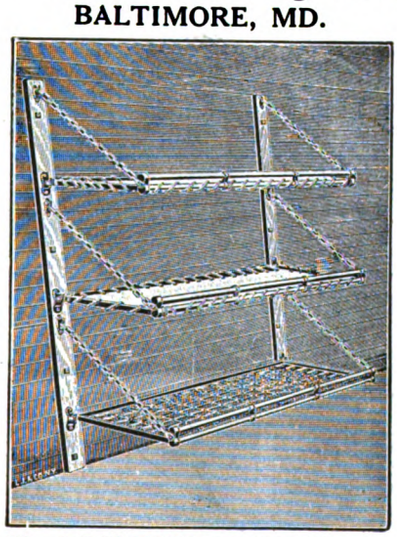
The Southern Bedding Company
BALTIMORE, MD.



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MANUFACTURERS OF

Metal Berths and Bunks of Every Description

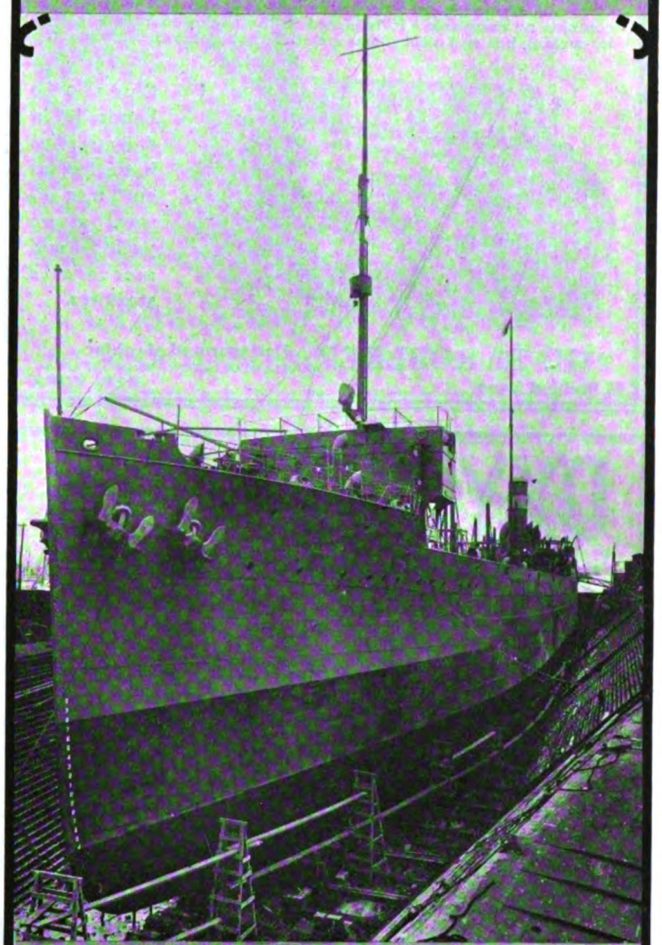
Illustrated Catalog upon request

SOUTHERN BEDDING COMPANY
BALTIMORE, MD.

Our Dry Docks SAVE TIME

Two Docks, coupled with Complete Shop Facilities, cut repair periods to a minimum.

	Upper Dock	Lower Dock
Length on Keel Blocks, feet	600	437
Width of Dock Floor, feet	62	50
Draft over Sill at Low Water, feet	22½	22½



Cargo Carriers Early Deliveries

Two New Building Slips now under construction will take Vessels up to 325 feet long, 50 feet beam and 32 feet deep. Electric Overhead Cranes speed up the job.

We have other Building Slips for smaller Craft.

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BALTIMORE, MD.
Cable Address—Baltodocks, U.S.A.

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Burn Continuously From Eighty to Three Hundred and Sixty-five Days and Can be Seen a Distance of Six Miles

Controlled by

SAFETY CAR HEATING & LIGHTING CO.
2 RECTOR STREET, NEW YORK

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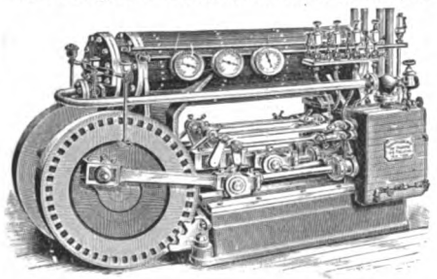
The Allen Dense-Air Ice Machine

contains no chemicals. It is placed in the engine room, while the ice-making box and meat rooms are at distant places of the steamer.



Over two hundred in daily service in the tropics on men-of-war, steam yachts and mercantile steamers.

H. B. ROELKER, Designer and Manufacturer of Screw Propellers
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The Clothel Company

MANUFACTURERS OF

Low Pressure

REFRIGERATING MACHINES

Marine Work a Specialty

Office:

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OXYHYDROGEN

QUINTESSENCE OF PURITY

as made by the

I.O.C. SYSTEM

Will perform from 20 to 30% more work than ordinary oxygen. The I. O. C. System Oxygen and Hydrogen Generators offer the cheapest method of producing these gases whenever and wherever required.
Automatic, safe, simple and free from upkeep expense.
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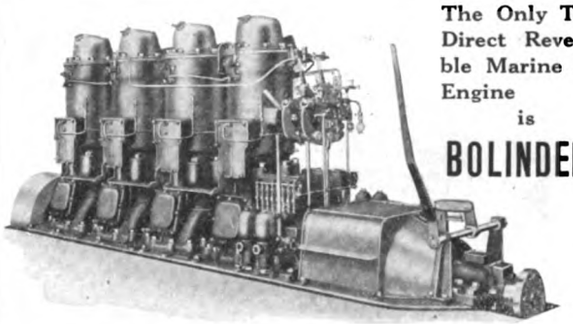
International Oxygen Company

Works: Newark, N. J. **General Sales Office, 115 Broadway, NEW YORK**
Pittsburgh, Pa., Park Bldg. Paris, France, 40 Rue Laffitte



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BOLINDERS

BOLINDERS COMPANY
30 CHURCH STREET **NEW YORK**

ST. LAWRENCE MARINE RAILWAY COMPANY

OGDENSBURG, N. Y.

Carriage accommodates every ship of Welland Canal size.

Fully equipped for repairs to Wood and Steel boats.

BOILER AND MACHINE SHOP
HIGH CLASS WORK

THE MARINE REVIEW COURSE FINDER

By Clarence E. Long

Contains all the true and mean correct magnetic courses; true and correct magnetic bearings of the river and harbor lighted and unlighted ranges for all the lakes; also a simple method for shaping and making these courses by any compass and for any boat.

Price $2.50, Postpaid

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Penton Building **CLEVELAND, OHIO**

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Other kinds give **long** service—**profitable** service. These, if bought at a reasonable price, are **economical.**

N.B.O. Sheet Packing

is the **Economical** kind of sheet packing. It is the **"cheapest per year"** sold, because it gives you the most service for your money.

"N. B. O." is unequaled as a joint packing, not only on steam lines, but also on **ammonia, gas, oil** and **alkali.**

We'll be glad to send you a sample piece large enough for you to give it a satisfactory trial.

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Electric Lighting Equipments, Fixtures, Etc.

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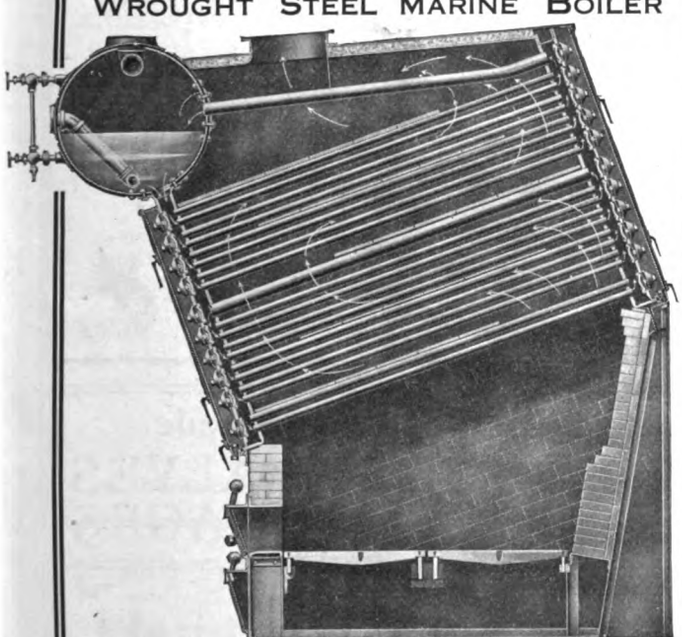
WROUGHT STEEL MARINE BOILER



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CHARLESTON, WEST VIRGINIA
MARINE ENGINES RIVER STEAMERS

The McNab

"CASCADE" BOILER CIRCULATOR AND FUEL ECONOMIZER
PATENTED

SAVED SOME FUEL

Capt. W. C. Richardson of Cleveland reports:—"The Steamer 'David Z. Norton' in 1913 burned 4,600 tons of fuel. In 1914 she burned 3,600 tons or about 1,000 tons less in 1914 than in 1913. This shows that your Circulators saved the 'Norton' some fuel. The same applies to the Steamer 'L. B. Miller' and the Steamer 'C. R. Hubbard'. The boats did not run as many miles in 1914 as in 1913 but you can SAFELY say there was a saving of 600 tons on each vessel."

Capt. Wm. Smith of Steamer "Harvester" reports:—"Your Circulators have created a LARGE SAVING IN FUEL, for twenty-five trips in 1913 we consumed 6,245 tons and for twenty-five trips in 1914 we consumed 5,625 tons."

We have many other reports similar to above

CAN YOU AFFORD TO NEGLECT THIS?

Write at once

THE McNAB CO., Bridgeport, Conn.

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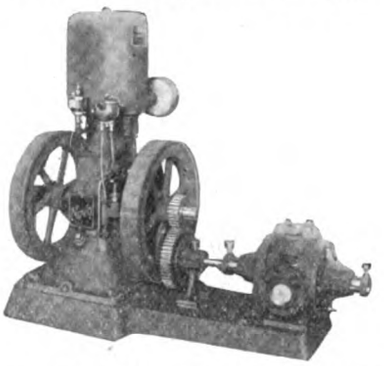
Can You Beat This With Your Bilge Pump?



By using Blackmer you have a pump for fighting fire and washing decks as well as bilge work.

We specialize in Bilge pumps and guarantee them to please you.

They are not an experiment as they have been in actual use for now upwards of nine years.

A letter from any of our customers will prove to you they are superior.

All pumps have but five working parts.

No springs.

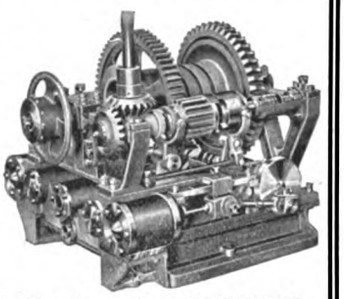
Wear automatically taken up.

Priming not necessary.

BLACKMER ROTARY PUMP COMPANY
PETOSKEY, MICH.

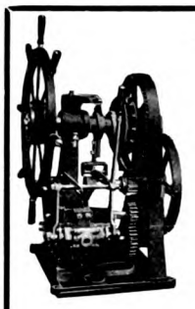
LIDGERWOOD

STEERING ENGINES
AND SHIP WINCHES



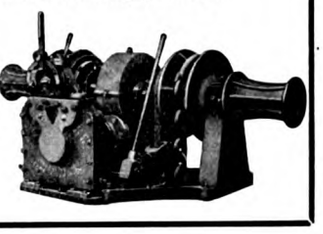
Built on duplicate part system

LIDGERWOOD MFG. CO., 96 Liberty St., NEW YORK



STEAM STEERING ENGINES
CAPSTANS
WINDLASSES
MOORING HOISTS
DRILL HOISTS
SPUD HOISTS, ETC.

Write for new catalog just out



Dake Engine Co.
Grand Haven, Mich.

Boston & Lockport Block Co.

124 Condor Street, East Boston, Mass.

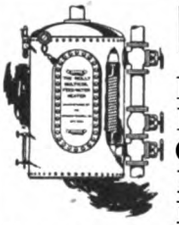
New York City 33 South St. | Chicago 413 Fort Dearborn Bldg | San Francisco 110 Market St.

★ STAR BRAND ★
BLOCKS—PUMPS

FERRALL'S HUB HOISTER

The best rope saving coal or cargo hoisting block manufactured. Made for either manila or wire rope. Sheaves are fitted with star metaline bushings and side bearings, which keep the sheaves from heating.

LOUDS Diaphragm Pumps



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Reilly Multicoil Evaporators, Feed Water Heaters, Fuel Oil Heaters and Multiscreen Feed Water Filters and Grease Extractors are specially designed to meet the severe requirements of marine service. ***WRITE FOR BULLETINS***

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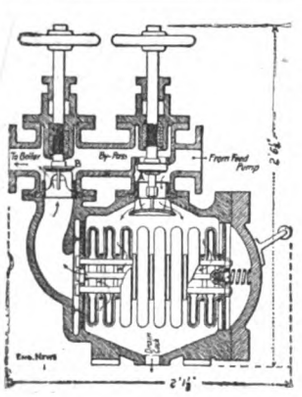
Successor to James Reilly Repair & Supply Co.
Engineers—LAND AND MARINE—*Manufacturers*
2121 West St. Building, NEW YORK



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Feed-Water Filters

will keep oil out of your boiler

They Have No Equal

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Troy, N. Y.

Ashton Highest Grade
POP SAFETY VALVES AND STEAM GAGES

Guaranteed to give Unequalled Efficiency, Durability and Perfect Satisfaction

Special Features in Valves

Outside Pop Regulation, Cam Lever Attachment, Jessop Steel Spring, Gages have Non-Corrosive Movements, Accurately Graduated Dials, Seamless Drawn Springs.

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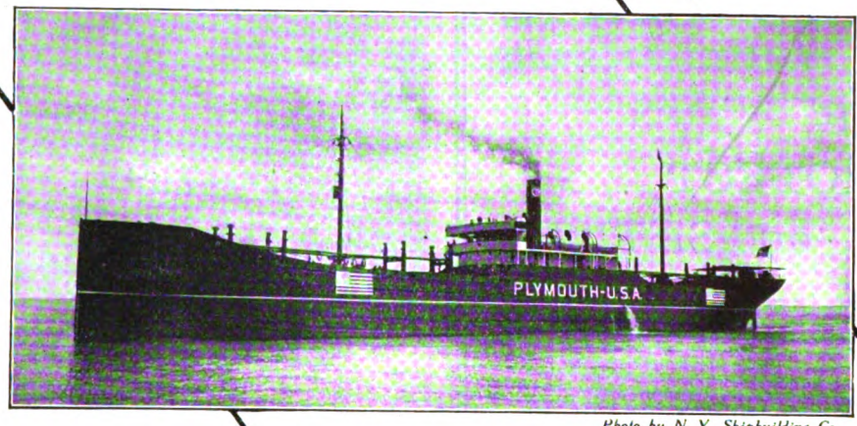

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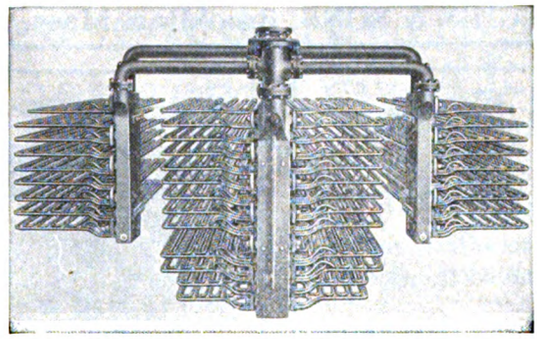

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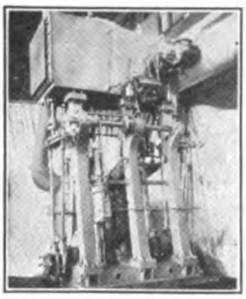

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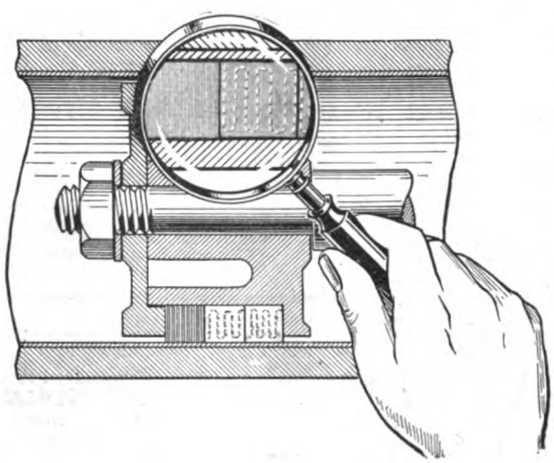

Here are two inside packed pistons. One packed with laminated hydraulic packing, the other with J-M Universal. You know what the action of the cylinder wall on these packings is—a swiping side-pull. The packing really sweeps the cylinder wall.

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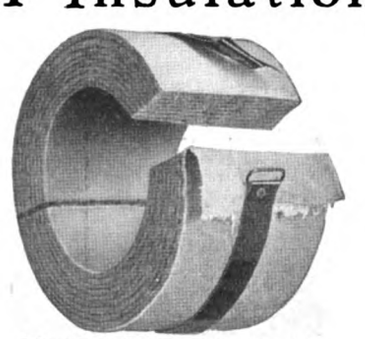

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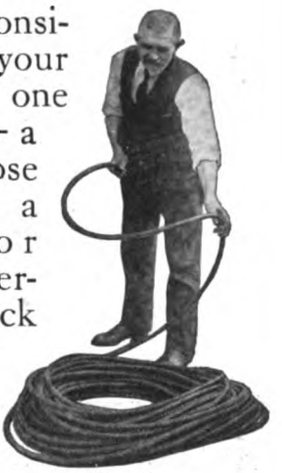

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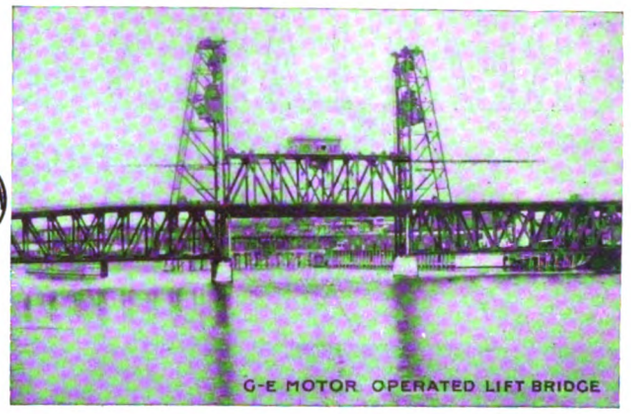

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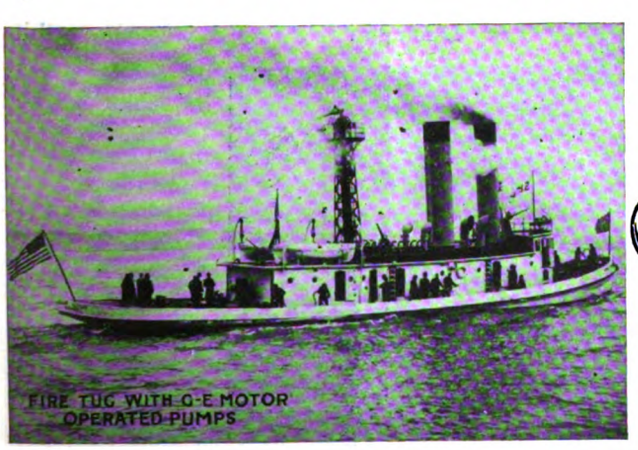

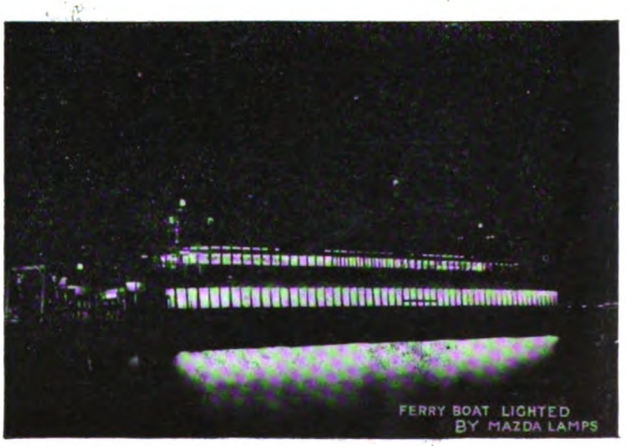

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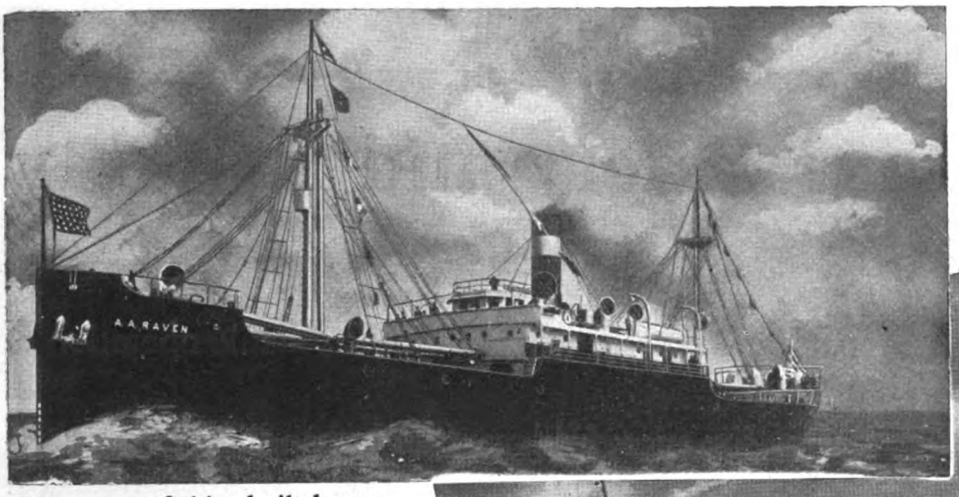

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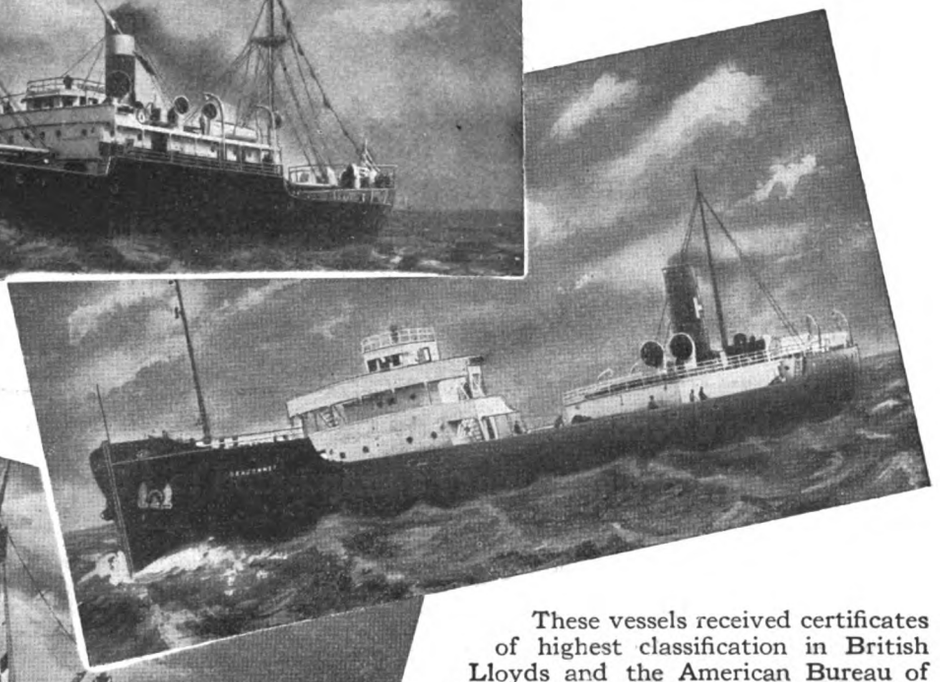

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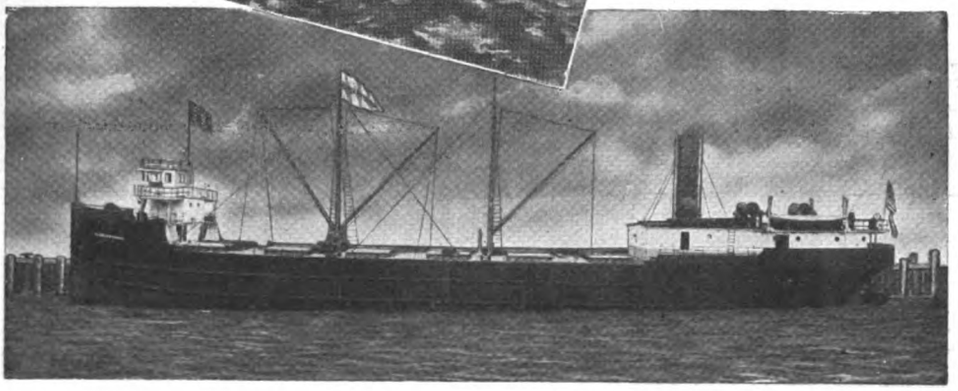

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Seattle Const. & Dry Dock Co.

FUELING COMPANIES AND COAL DEALERS.
Hall, Geo., Coal Co.
Hanna, M. A., & Co.
Lorain Coal & Dock Co.
Pickands, Mather & Co.

FURNACES.—(Boilers.)
Continental Iron Works, The

FURNACE FRONTS AND DOORS.—(Land and Marine.)
Continental Iron Works, The

GAGES.—(Steam.)
Ashton Valve Co.

GAGES.—(Water.)
Penberthy Injector Co.

GASKETS.
Johns-Manville, H. W., Co.

GENERATORS.
General Electric Co.
International Oxygen Co.

GRAPHITE.
Dixon, Joseph, Crucible Co.
Johns-Manville, H. W., Co.

GRAPHITE.—(Boiler Lubricating, Greases.)
Dixon, Joseph, Crucible Co.

GRATE BARS.
Trout Co., H. G.

GREASES.
Dixon, Joseph, Crucible Co.

GYPSEYS.—(Steam.)
American Engineering Co.

HATCH FASTENERS.
Hynd, Alexander
Mulholland Hatch Fastener Co.

HAMMERS.—(Steam.)
Chase Machine Co.

HEATERS AND PURIFIERS.—(Feed Water.)
Ross Valve Mfg. Co.

HOISTS.—(Air.)
American Ship Building Co.
Great Lakes Engineering Works

HOISTS.—(Anchor.)
Superior Iron Works

HOISTS.—(Cargo, Etc.)
American Engineering Co.
Boston & Lockport Block Co.
Chase Machine Co.
Dake Engine Co.
General Electric Co.
Lidgerwood Mfg. Co.

HOISTS.—(Chain.)
Dake Engine Co.

HOISTS.—(Electric.)
American Engineering Co.
General Electric Co.
Lidgerwood Mfg. Co.

HOISTS.—(Pneumatic.)
Dake Engine Co.

HOSE.
Schrader's Son, A., Inc.

HOTELS.
Hotel Tuller

HYDROGEN GENERATORS.
International Oxygen Co.

ICE MACHINES.
Roelker, H. B.

INDICATORS.
Electro Dynamic Co.
McNab Co.

INDICATORS.—(Direction.)
Electro Dynamic Co.
McNab Co.

INDICATORS.—(Recording.)
McNab Co.

INDICATORS.—(Speed.)
Johns-Manville, H. W., Co.
McNab Co.

INJECTORS.
Penberthy Injector Co.

INSULATION.—(Asbestos and Electrical.)
Johns-Manville, H. W., Co.

INSURANCE.—(Marine.)
Boland & Cornelius
Hutchinson & Co.
Richardson, W. C., & Co.
Vance & Joys Co.

IRON ORE.
Hanna, M. A., & Co.
Pickands, Mather & Co.

LADDERS.—(Portable.)
McArthur Portable Fire Escape Co.

LAMPS.—(Mazda and Arc.)
General Electric Co.

LANTERNS.—(Buoy.)
Safety Car Heating & Lighting Co.

LAUNCHES.
Drein, Thomas & Sons

LIFE BOATS
Detroit Ship Bldg. Co.
Drein, Thomas & Son
Kahnweiler's Son, David
Lane, C. M., Life Boat Co.
Welin Marine Equipment Co.

LIFE RAFTS.
Detroit Ship Building Co.
Drein, Thos., & Son
Lane, C. M., Life Boat Co.

LIFE BOAT RELEASING DEVICE.
Lane, C. M., Life Boat Co.
Mulholland Hatch Fastener Co.

LIFE BOAT SYSTEM.
Lane, C. M., Life Boat Co.
Welin Marine Equipment Co.

LIFE PRESERVERS.
Bauer, Justus, & Son, Inc.
Kahnweiler's Sons, David
Lane, C. M., Life Boat Co.

LIFE SAVING EQUIPMENT.
Bauer, Justus, & Son, Inc.
Drein, Thos., & Son
Kahnweiler's Sons, David
Lane, C. M., Life Boat Co.
Welin Marine Equipment Co.

LIGHTS.
Safety Car Heating & Lighting Co.

LIGHTS.—(Electric.)
Cory, Chas., & Son
General Electric Co.

LOGS.—(Ship.)
Walker, Thomas, & Sons

LUBRICANTS.
Dixon, Joseph, Crucible Co.

LUBRICATING GRAPHITE.
Dixon, Joseph, Crucible Co.

LUBRICATORS.
Penberthy Injector Co.

MACHINERY.
Kingsford Foundry & Machine Works

MACHINERY.—(Marine.)
American Ship Building Co.
Chase Machine Co.
Chicago Ship Building Co.
Collingwood Ship Bldg. Co.
Dake Engine Co.
Detroit Ship Building Co.
Fletcher Co., W. & A.
Fore River Ship Building Corp.
Great Lakes Engineering Works
Johnston Bros.
Manitowoc Ship Bldg. & Dry Dock Co.
Sheriffs Mfg. Co.
Superior Iron Works
Superior Ship Building Co.
Toledo Ship Building Co.

MACHINISTS.
Chase Machine Co.
Superior Iron Works
Marine Equipment
Seattle Construction & Dry Dock Co.

MARLINE.
Waterbury Co.

MARLINE COVERED WIRE ROPE.
Waterbury Co.

MECHANICAL WORKS.
Engberg's Elec. & Mech. Wks.

MOORING LINES
Durable Wire Rope Co.

MOTORS.—(Electric.)
Electro Dynamic Co.
General Electric Co.

MOTORS.—(Winch.)
General Electric Co.

MUSIC WIRE.
Waterbury Co.

NAUTICAL INSTRUMENTS.
Ritchie, E. S., & Sons.

NOZZLES.
Morse, A. J., & Sons

OAKUM.
Stratford Oakum Co., Geo.

OILS AND LUBRICANTS.
Dixon, Joseph, Crucible Co.

OIL.—(Linseed.)
Patterson Sargeant Co.

OIL ENGINES.
Bolinders Co.
Southwark Fdy. & Mch. Co.

OXYGEN AND HYDROGEN CYLINDERS AND CYLINDER STUD VALVES.
International Oxygen Co.

OXYGEN TESTING APPARATUS, WELDING AND CUTTING APPARATUS.
International Oxygen Co.

OXYGEN GENERATORS
International Oxygen Co.

PACKING.
Home Rubber Co.
Johns-Manville, H. W., Co.

PACKING.—(Metallic, Sheet Rubber, Spiral and Coil Steam.)
Johns-Manville, H. W., Co.

PAINT.—(Copper and Iron.)
Patterson-Sargeant Co.

PAINT.—(Graphite.)
Dixon, Joseph, Crucible Co.
Patterson-Sargeant Co.

PAINT.—(Hull.)
Patterson-Sargeant Co.

PAINT.—(Marine.)
Patterson-Sargeant Co.

PATENTS.
Siggers & Siggers

PIG IRON
Hanna, M. A., & Co.
Pickands, Mather & Co.

PIPE.—(Welded Steel.)
Continental Iron Works, The

PIPE COVERING.
Johns-Manville, H. W., Co.

PLUMBAGO.
Dixon, Joseph, Crucible Co.

POWER PLANTS.
General Electric Co.

PROJECTORS.—(Electric.)
General Electric Co.

PROPELLER WHEELS.
American Ship Building Co.
Case, A. Wells, & Son
Detroit Ship Building Co.
Fore River Ships Building Corp.
Great Lakes Eng. Works
Hyde Windlass Co.
Milwaukee Dry Dock Co.
Roelker, H. B.
Sheriffs Mfg. Co.
Superior Ship Building Co.
Toledo Ship Building Co.
Trout Co., H. G.

PROVISIONS.—(Ship.)
Brogan, J. P.
Gehm, John
City & Marine Meat Market.
Erdman, Joseph
Gunn, P. J.
Jung, J. & W., Co.
Karr, J. W., Marine Supply Co.
Koehler Bros.
Miller, J.
Schroeder Bros. Co.
Schuette Bros. Co.
Spademan & Co.
Williams, William.

PUMPS.
Boston Lockport & Block Co.

PUMPS AND APPLIANCES.—(Air.)
Great Lakes Engineering Works
Kingsford Fdy. & Machine Co.

PUMPS.—(Bilge.)
Blackmer Rotary Pump, Power & Mfg. Co.

PUMPS.—(Miscellaneous Use.)
Blackmer Rotary Pump, Power & Mfg. Co.
Great Lakes Engineering Works.
Kingsford Fdy. & Machine Co.
Roelker, H. B.

REFRIGERATING MACHINERY.
Clothel, The, Co.
Great Lakes Eng. Works
Johns-Manville, H. W., Co.
Roelker, H. B.

REGULATORS.—(Pressure.)
Ross Valve Mfg. Co.

RELEASING DEVICE.—(Life Boat.)
Mulholland Hatch Fastener Co.

REPAIRS.—(Boiler.)
Commercial Boiler Works, The
Michigan Salt Works

REPAIRS.—(Marine.)
American Ship Building Co.
Baltimore Dry Dock & Ship Bldg. Co.
Buffalo Dry Dock Co.
Chicago Ship Building Co.
Collingwood Ship Building Co.
Delaney, P., & Co.
Detroit Ship Building Co.
Fore River Ship Building Corp.
Goldschmidt Thermit Co.
Great Lakes Engineering Works
Johnston Bros.
Kennedy Valve Mfg. Co.
Manitowoc Ship Bldg. & Dry Dock Co.
Milwaukee Dry Dock Co.
St. Lawrence Marine Ry. Co.
Seattle Construction & Dry Dock Co.
Sheriffs Mfg. Co.
Superior Ship Building Co.
Tietjen & Lang Dry Dock Co.
Toledo Ship Building Co.

RIVETS.—(Steel for Ships and Boilers.)
Great Lakes Engineering Works.

ROPE.
Durable Wire Rope Co.

ROPE.—(Wire, Manilla & Fibre-clad.)
Waterbury Co.

ROPE AND FITTINGS.
Durable Wire Rope Co.

ROPE DRESSING.
Dixon, Joseph, Crucible Co.

ROPE DRIVES.
Waterbury Co.

SEARCHLIGHTS.
General Electric Co.

SHEAVES.
Boston & Lockport Block Co.

SHEAVE LUBRICATING DEVICE.
Mulholland Hatch Fastener Co.

SHEET IRON WORK
Commercial Boiler Works, The

SHIPS.—(Builders of.)
American Ship Building Co.
Baltimore Dry Dock & Ship Bldg. Co.
Bath Iron Works
Buffalo Dry Dock Co.
Chicago Ship Building Co.
Collingwood Ship Building Co.
Detroit Ship Building Co.

See Index to Advertisements for pages containing advertisements of companies listed above

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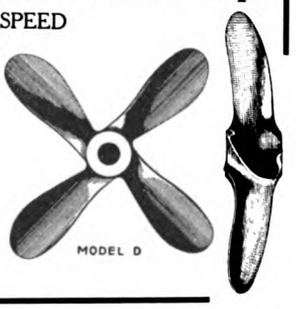
A. SCHRADER'S SON, Inc.
783-791 ATLANTIC AVE., BROOKLYN, N. Y.
Manufacturer of
Diving Apparatus

HIGHEST AWARDS
GOLD MEDAL at Jamestown Exposition 1907
GRAND PRIZE at Alaska Yukon Pacific Exposition 1909
LARGE STOCK ALWAYS ON HAND
Furnishers to U. S. Navy and U. S. Army Engineer Corps.
Outfits for Contractors, Waterworks, Sponge and Pearl Fishers, etc.

CASE OUTWARD THRUST PROPELLER WHEELS
For Any Vessels, from Launches to Battleships
GREATEST POWER AND SPEED
LEAST VIBRATION
The most powerful and smoothest running Propeller on the market.
The maximum of efficiency.
Write for Catalog



A. WELLS CASE & SON
HIGHLAND PARK, CONN.

McArthur Jacob's Ladder

This ladder embraces several new features which have been dictated by experience and is the ideal ladder for use aboard ship.

It is now made in sections of any desired length. The sections can be instantly connected by means of snap hooks, adapting the ladder to light or loaded conditions of ships and eliminating the telescopic feature of the former type.

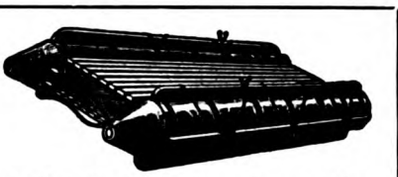
The cable is of plow steel combining lightness with great strength; the steps stamped sheet metal with two-tooth prongs giving a firm foothold; hooks bronze and rivets copper.

The ladder can be compactly rolled up for storage.

"We beg to advise that the Jacob's Ladder furnished the steamer Castalia during season 1913 has proven very satisfactory indeed. The master, Capt. W. L. Girardin, reports that these ladders should be installed on all the boats as they are very efficient and much safer than the old style roper ladder."
The Brown Steamship Company, Cleveland.

McArthur Portable Fire Escape Co.
CLEVELAND OHIO
The McArthur Jacob's Ladder is patented and all infringements upon it will be prosecuted

THOS. DREIN & SON COMPANY
Established 1866
WILMINGTON, DEL.
Sole Builders of the
Patent Beaded Bottom Metallic Life Boats, Life Rafts and Wooden Boats of all classes.



Outfits for Lake Steamers a Specialty

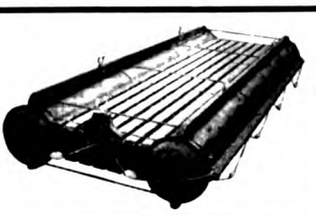
ANDREW J. MORSE & SON, Inc.
221 High Street BOSTON, MASS.
ESTABLISHED 1837
Diving Apparatus and Submarine Armor
Fire Department Supplies
The Morse Monitor Nozzle

LANE LIFE BOATS
C. M. LANE LIFE BOAT CO.

250 HURON ST. BROOKLYN, N.Y.
LAST LONGEST

LIFE PRESERVERS
Cork Cushions, Fenders, Cork Ring Buoys
"Ye Oldest Cork House in America"
ESTABLISHED 1865
JUSTUS BRAUER & SON
129 Arch Street Incorporated Philadelphia, Pa.

Lifeboats, Rafts, Davits
Famous for their QUALITY and ECONOMY
CATALOG ON REQUEST
WELIN MARINE EQUIPMENT CO.
305 Vernon Avenue LONG ISLAND CITY, N. Y.



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Great Lakes Engineering Works
Johnston Bros.
Kennedy Valve Mfg. Co.
Manitowoc Ship Building & Dry Dock Co.
Milwaukee Dry Dock Co.
Seattle Const. & Dry Dock Co.
Superior Ship Building Co.
Tietjen & Lang Dry Dock Co.
Toledo Ship Building Co.

SMOKE STACKS.
Lake Erie Boiler Works

SPECIALTIES.—(Steam.)
Hynd, Alexander
Penberthy Injector Co.
Ross Valve Mfg. Co.

SPRINGS.—(Bed & Bunk.)
Southern Bedding Co.

STAYBOLTS.—(Boiler, Iron or Steel, Hollow or Solid.)
Falls Hollow Staybolt Co.

STEAMSHIP LINES.—(Passenger and Freight.)
American Line
International Mercantile Marine Co.

STEERING GEARS.
American Engineering Co.
American Ship Building Co.
Chase Machine Co.
Dake Engine Co.
Detroit Ship Building Co.
Hyde Windlass Co.
Sheriffs Mfg. Co.

STOCKS.
Armstrong Mfg. Co.

STOKERS.
American Engineering Co.
Babcock & Wilcox Co.

STOPPERS.—(Chain.)
American Engineering Co.

SUBMARINE ARMOR.
Morse, A. J., & Son
Schrader's Son, Inc., A.

SUBMARINE WORK.
Great Lakes Dredge & Dock Co.

SUPERHEATERS.—(Marine.)
Babcock & Wilcox Co.
Locomotive Superheater Co.

SUPPLY HOUSES.
Brogan, J. P.
Gehm, John.
City & Marine Meat Market.
Erdman, Joseph.
Gunn, P. J.
Jung, J. & W., Co.
Karr, J. W., Marine Brokerage Co.
Koehler Bros.
Miller, J.
Schroeder Bros. Co.
Schuette Bros. Co.
Spademan & Co.
Williams, William

SURVEYORS.—(Marine.)
Babcock & Penton
Curr, Robert
Furstenau, M. C.
Hynd, Alexander

SWITCHBOARDS.
General Electric Co.

TANKS.
Bath Iron Works

TANKS.—(Riveted.)
Lake Erie Boiler Works

TANKS.—(Steel.)
Fore River Ship Building Corp.

TANKS.—(Welded Steel.)
Continental Iron Works, The

TELEGRAPH.—(Mechanical.)
Cory, Chas., & Sons

TESTS OF MATERIALS.
Babcock & Penton
Curr, Robert
Furstenau, M. C.
Hynd, Alexander

THERMIT.
Goldschmidt Thermit Co.

TOWING LINES.—(Manila, Wire.)
Waterbury Co.

TOWING MACHINES.
American Engineering Co.
Chase Machinery Co.

TRAMWAYS.—(Wire Rope.)
Waterbury Co.

TRANSMISSION.—(Rope.)
Waterbury Co.

TUGS.
Bath Iron Works

TURBINES.
Bath Iron Works
Fletcher, W. A., & Co.
Fore River Ship Building Corp.

VALVES.
Ashton Valve Co.
Penberthy Injector Co.
Ross Valve Mfg. Co.

VALVES.—(For Water and Gas.)
Ashton Valve Co.

VESSEL AGENTS.
Vance & Joys Co.

VESSEL BROKERS.
Farley, Edward P., Co.
Richardson, W. C., & Co.

WELDING.—(Flue.)
Case, A. Wells, & Son

WELDING PROCESSES.
Goldschmidt Thermit Co.

WINCHES.
American Engineering Co.
Chase Machine Co.
Hyde Windlass Co.
Lidgerwood Mfg. Co.

WINDLASSES.
American Engineering Co.
American Ship Building Co.
Dake Engine Co.
Hyde Windlass Co.

WIRE.
Waterbury Co.

WIRE AND WIRING DEVICES.
General Electric Co.

WIRE ROPE.
Durable Wire Rope Co.
Waterbury Co.

WIRE ROPE DRESSING.
Dixon, Joseph, Crucible Co.

YACHTS.—(Builders.)
Bath Iron Works

YACHT PLUMBAGO.
Dixon, Jos., Crucible Co.

YARN.—(Lath, Fodder.)
Waterbury Co.

YAWLS.
Drein, Thos., & Son
Manitowoc Ship Bldg. & Dry Dock Co.

STRATFORD OAKUM

QUALITY GUARANTEED

JERSEY CITY and EVERYWHERE

GEO. STRATFORD OAKUM CO., 165 Cornelison Ave., Jersey City, U. S. A.

H. G. Trout Company

King Iron Works
BUFFALO, N. Y.

Manufacturers of High Grade
PROPELLER WHEELS

Marine Engines
Brass and Iron Casting

Large variety of Grate Bars in stock

Write for particulars and testimonials.

GREAT LAKES DREDGE & DOCK CO.
MANUFACTURERS OF
REINFORCED CONCRETE PILES
for detail see previous issues of this Paper
HOME OFFICE IN CHICAGO
CONCRETE PILE DEPARTMENT IN CLEVELAND

MARINE BOOKS

We have just issued a new book catalog listing and describing in detail all the recognized books on marine subjects. A copy is yours for the asking.

Penton's Book News, Cleveland, Ohio

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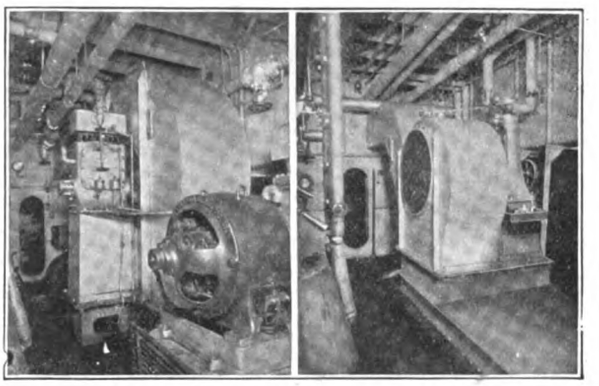
G. H. Breymann & Bros.

CONTRACTORS FOR PUBLIC WORKS

Dredging, Dock Building, Etc.

MARINE BUILDING
TOLEDO, OHIO

Branch Office, East Boston, Mass.



72" Steel Plate Fan—**Both for same duty**—36" "Sirocco" Multi-blade Fan

"Sirocco"
TRADE MARK.

Multi-Blade Fans for Forced Draft

Save Money because they **Save Power.** They save power because their design is such as to make use of **every bit** of energy consumed with the least possible waste.

Catalogue No. **34316** contains reliable information on Mechanical Draft. Yours upon request.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN, U.S.A.
Canadian Sirocco Co., Limited, Windsor, Ont., Manufacturer for Canada

MARINE BOILERS

Marine Repairs

Newburgh Steam Boiler Works

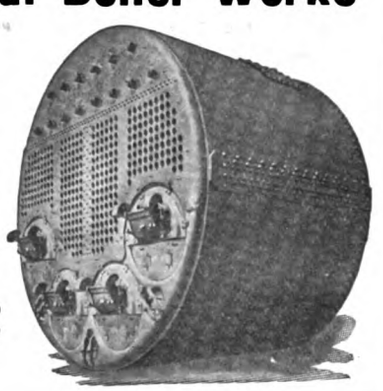
P. DELANY & CO.
Newburgh, N. Y.

Commercial Boiler Works

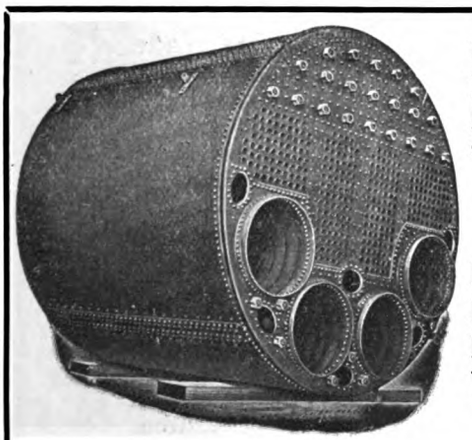
Manufacturers and Repairers of Boilers

Marine Work a Specialty

All Kinds of Sheet Iron Work



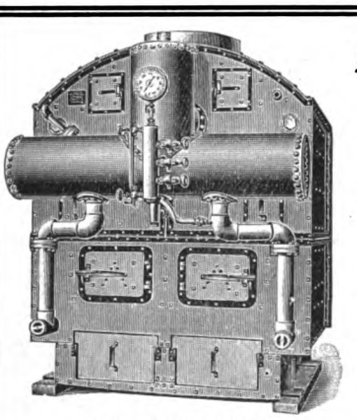
SEATTLE U. S. A.



MARINE BOILERS

OF ALL TYPES

KINGSFORD FOUNDRY & MACHINE WORKS,
Oswego, N. Y.



Almy Water Tube Boiler Co.

Builders of Sectional Water Tube Boilers for all types of vessels

Providence, R. I. U. S. A.

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BUFFALO, N. Y.

JOHN GEHM, dealer in choice meats of all kinds, 38 to 45 Elk St. Market, Buffalo, N. Y. Bell Phone, Seneca 1204. Frontier Phone 21134. Hotels, Restaurants and Boats supplied at special rates. Residence, 378 N. Division St. Bell Phone, Howard 489.

P. J. GUNN, 120 Michigan Ave., Buffalo, N. Y. Groceries and marine supplies. Auto truck and launch delivery.

CLEVELAND, O.

J. P. BROGAN, wholesale and retail grocer. Vessel trade solicited. Launch delivery. 1386-88 W. Twenty-fifth St., Cleveland, O.

THE J. U. KARR MARINE SUPPLY CO., 1330 West 11th St., **Cleveland, O.** Groceries, meats, fruits, vegetables, milk, ice, coal. General ship supplies.

DULUTH, MINN.

THE DULUTH MARINE SUPPLY CO. Largest on the Great Lakes. Meats, groceries, ship chandlery, cabin supplies, oils, ice and milk. Delivered directly and promptly by our three tugs aboard ship. Foot of Fifth Ave. West. 780 both phones.

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J. MILLER, 2337 W. Jefferson, Detroit, Mich. (Delray Station). **Near Zug** Island dock. **Groceries, meats, etc. Boat orders executed promptly and accurately,** from store to **delivery** boat.—No **wagons.**

JOSEPH ERDMAN, 932-936 Congress St. East, Detroit, Mich. Fine groceries and meats. Imported wines and liquors. Paints, oils, leads, etc. Prompt deliveries. Phones: East 110, East 3028.

ESCANABA, MICH.

CITY & MARINE MEAT MARKET, Theo. Bittner, Prop., Escanaba, Mich.

LORAIN, O.

SPADEMAN & CO., 168-170 E. Erie Ave., Lorain, O. Meats, groceries and general ship supplies.

MANITOWOC, WIS.

SCHUETTE BROS. CO., Manitowoc, Wis. Groceries, provisions, dry goods and general merchandise.

MARQUETTE, MICH.

WM. WILLIAMS, 134 Baraza Ave., Marquette, Mich. Phone 429. **Fresh,** smoked and salt meats, can **goods, butter,** eggs and poultry. **Marine trade a** specialty.

SANDUSKY, O.

KOEHLER BROS., 209 **Adams St.,** Sandusky, O. **City** and **Marine Meat** Market. Meats and Sausages **of all** kinds. Vessel supplies **a specialty. Launch** delivery. Both Phones 344.

SHEBOYGAN, WIS.

J. & W. JUNG CO., Sheboygan, **Wis.** —A Department Store with a Clean Grocery Stock and prompt **service. Ask** for Jung's Store.

TWO RIVERS, WIS.

SCHROEDER BROS. CO., Two Rivers, Wis. Dealers in general **mdse.,** staple and fancy groceries, fruits and vegetables. Marine trade solicited and promptly served.

Are You Conducting the Most Sanitary Supply House in Your City?

You surely are not ready to admit that a better line of goods is being carried by some competitor of your's. A national pure food campaign has awakened a demand everywhere for the ***best and purest products obtainable,*** and every firm that can fill this demand, made by either an individual or a wholesale consumer, is going to prosper with increased, steady patronage as soon as its superior line becomes generally known.

"The Lake Carriers' Association" instituted a vigorous campaign on the ***Great Lakes*** and, as a result, this trade has come to be fully as particular as the most discriminating individual buyer. There is, however, a great ***difference in the consumption*** of these purchasers and the importance of catering to the requirements of the large boat companies at once becomes apparent.

And the conditions now existing on the lakes correctly portray what the supply houses on the coasts must do to secure the bulk of the business from the steamship lines plying on the high seas.

Do you want to be the representative sanitary supply house for marine trade in your port? If you do, your advertisement on this page will enable you to occupy that position providing the publicity thus gained is backed by the proper conduct of your business.

It's up to you! The cost is only Five Dollars ($5.00) for a year's advertising, including subscription to the paper—a proposition that merits your immediate and favorable consideration.

Send copy for your ad. TODAY for the next issue! Forms close on the 5th.

THE MARINE REVIEW
Cleveland, O.

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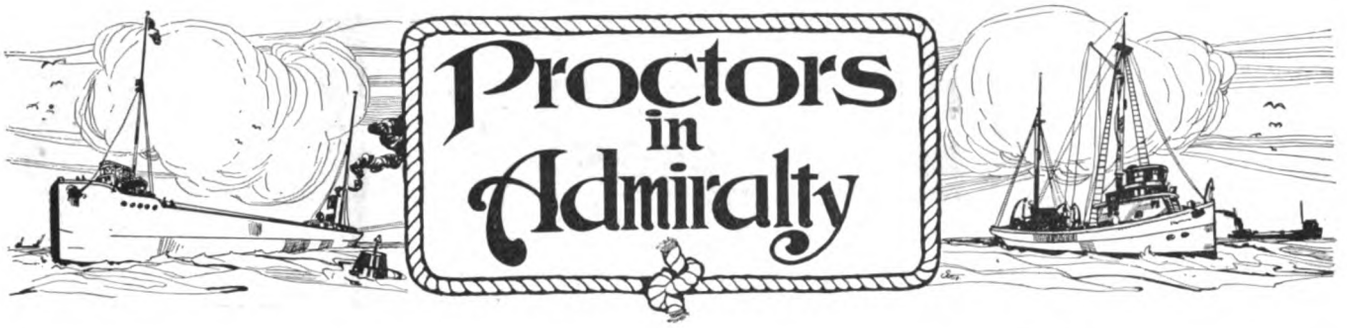

ALBERT J. GILCHRIST

PROCTOR IN ADMIRALTY

Rockefeller Building

CLEVELAND, O.

C. E. KREMER,

COUNSELOR AT LAW AND
PROCTOR IN ADMIRALTY

Suite 1012-1016 Insurance Exchange Building
CHICAGO, ILL.

GOULDER, WHITE AND GARRY

LAW OFFICES

Rockefeller Building CLEVELAND, O.

Price, Alburn, Crum & Alburn

ATTORNEYS AT LAW AND
PROCTORS IN ADMIRALTY

W. U. Cable Address: "Priburdo" 712-724 Rockefeller Bldg.,
Telephones: Bell, Main 3931 Cuy., Erie 66 Cleveland.

S. H. HOLDING, F. S. MASTEN, T. H. DUNCAN and F. L. LECKIE

HOLDING, MASTEN, DUNCAN & LECKIE

ATTORNEYS AT LAW AND
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840-848 Rockefeller Building CLEVELAND, O.

Spencer & Spencer

ATTORNEYS AT LAW

PROCTORS IN ADMIRALTY

Alworth Building, Duluth, Minn.

HOYT, DUSTIN, KELLEY, McKEEHAN & ANDREWS,

LAWYERS AND PROCTORS IN ADMIRALTY

Offices, 702 Western Reserve Bldg.,
CLEVELAND, O.

WARREN, CADY, LADD & HILL

ATTORNEYS AT LAW AND PROCTORS
IN ADMIRALTY

Charles B. Warren
William B. Cady
Sanford W. Ladd
Joseph G. Hamblen, Jr.
Sherwin A. Hill

Claudius B. Grant, Counsel
Union Trust Building, Detroit

The Dignified Means

Whereby every professional man interested in the marine field may increase his clientele is offered thru ***The Marine Review.***

Proctors in Admiralty, who keep their names constantly before our readers, have a distinct advantage over non-advertisers—there's a prestige gained thru ***The Marine Review*** that cannot be obtained in any other way.

Your professional card on this page would cost a very small amount and the investment would prove the best you ever made in publicity service.

Rates gladly quoted upon request.

THE MARINE REVIEW :: :: :: **Cleveland, Ohio**

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John J. Boland — Adam E. Cornelius

BOLAND & CORNELIUS

VESSEL OWNERS AND BROKERS

Marine Insurance Agents

1204 Prudential Building,
BUFFALO, N. Y.

D. SULLIVAN — A. C. SULLIVAN

D. SULLIVAN & COMPANY

VESSEL AGENTS

Continental & Commercial Bank Building
208 South LaSalle Street
CHICAGO, ILL.

C. L. Hutchinson — W. H. McGean

HUTCHINSON & CO.

VESSEL AND INSURANCE AGENTS

Phones: { Office; Main 2453
Res. C. L. Hutchinson, Marlo 244
Res. W. H. McGean, Garfield 274

1011 Leader-News Bldg. Cleveland

VANCE & JOYS CO.

VESSEL AND INSURANCE AGENTS

1004-1006 First National Bank Building

TELEPHONE MAIN 3907

MILWAUKEE, WIS.

W. C. Richardson — Clarence E. Richardson
John T. Kelly — Tracy H. Paine

W. C. RICHARDSON & CO.

VESSEL OWNERS AND BROKERS AND
MARINE INSURANCE AGENTS

816-818 Leader-News Bldg., Cleveland, O.

Office Tel., Main 338
Residence 'Phone { W. C. Richardson, Doan 404.
John T. Kelly, East 3610
Clarence E. Richardson, Eddy 492

The Great Lakes Red Book, 1915 Edition

A list of more than 1,000 vessels on the Great Lakes, together with the names of the owners, captains and engineers.

Bound with flexible paper cover, pocket size, postpaid anywhere, 50c.

A most useful directory. Compiled and published by

Penton's Book News, Cleveland, Ohio

6

Vessel and Insurance Agents—Everywhere

Need ***The Marine Review*** back of them today more than ever before because the prestige of the paper is constantly increasing.

The very men in the marine field—the actual boat owners and operators—whose business you wish to obtain can be effectively reached thru this paper and at a trifling cost.

The price of two good cigars a day applied to ***Marine Review*** publicity will enable you to substantially increase your business, and the possibilities should prompt you to make early reservation.

Tell us you're interested and we'll submit rates.

THE MARINE REVIEW
Cleveland, Ohio

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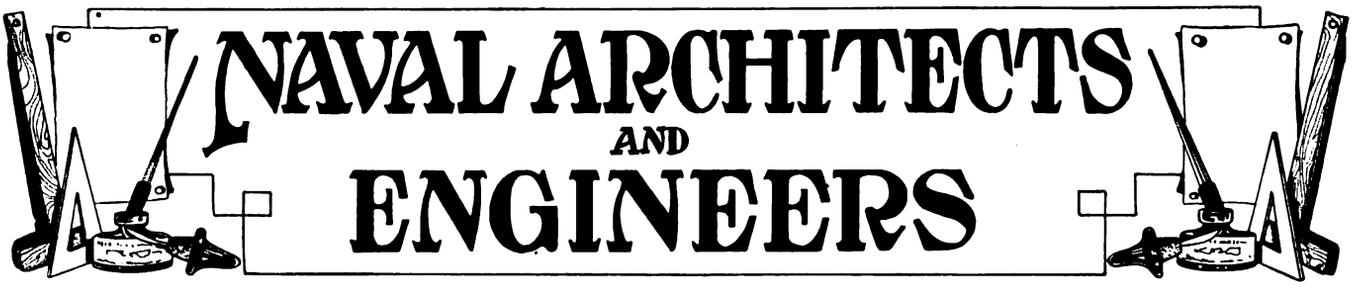

W. I. BABCOCK H. PENTON

BABCOCK & PENTON

ENGINEERS AND NAVAL ARCHITECTS

CLEVELAND — Penton Bldg., 1136 Chestnut Av.

NEW YORK — 17 State St.

M. C. FURSTENAU

CONSULTING MARINE ENGINEER
NAVAL ARCHITECT

All classes of vessels and machinery designed
Tests and surveys made

308 Walnut St.

Tel. Lombard 2789A — PHILADELPHIA, PA.

Cablegram: Curr, Port Arthur — Telephone: 1553 North

ROBERT CURR

SURVEYOR TO LLOYD'S REGISTER OF SHIPPING

Plans and Specifications furnished for all types of vessels. Careful attention given to superintending construction and repairs.
Instructions on Theoretical and Practical Shipbuilding by Correspondence.

The Observatory — 28 S. Water St., Port Arthur, Ont.

ALEXANDER HYND

CONSULTING ENGINEER, MARINE ARCHITECT AND SURVEYOR

Great Lakes Branch American Bureau of Shipping. Specifications and Designs for Hull and Machinery furnished. Supervision of Construction and Repairs, Damage Surveys, Valuations and Appraisals. Agent for Sturrock Patent Cast Iron Bridge Walls. Telephone Main 822.

872-874 Rockefeller Building — CLEVELAND, O.

WILLIAM T. DONNELLY

Designer of Floating Dry Docks, Steel and Wood

PLANS ON HAND FOR DOCKS FROM 2,000 TO 20,000 TONS

Electricity applied to Marine Transportation
Harbor Improvements

Consulting Engineer and Naval Architect

17 Battery Place — NEW YORK

JOHN REID & COMPANY

NAVAL ARCHITECTS

17 BATTERY PLACE ::: NEW YORK

Offices: London Glasgow Montreal

EDWARD P. FARLEY CO.

Vessel Brokers

Naval Architects and Engineers

Passenger and Freight Steamers, Tugs, Lighters, Self Propelled Canal Barges

1501 Railway Exchange Bldg. — Chicago, Illinois

REAL BARGAINS

in used equipment are constantly being offered the readers of *The Marine Review* thru its classified columns and it will pay you to

GET THE HABIT

of referring to this section each month.

TAKE A LOOK—NOW! You may find something of interest to you

111

Every Professional Man Knows

The value of the right kind of publicity but few actually apply that knowledge to their business.

The man who constantly keeps his name before the readers of a trade paper that reaches every branch of the industry in which he is interested is the one who prospers.

Mr. Marine Architect—Mr. Marine Engineer! If you are not advertising in *The Marine Review*, and you want to attain greater success, an ad. on this page will bring the desired results.

You need this service—let's start something for you in the next issue.

Write today for rates.

THE MARINE REVIEW :: :: :: **Cleveland, Ohio**

715302

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Vessel Fuel Coal of the best quality always available at all Lake Erie Ports. Prompt and satisfactory service guaranteed.

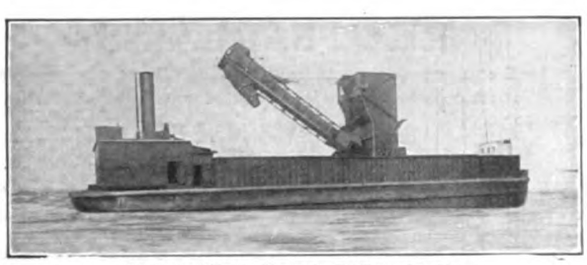
Wire or Phone Us

M. A. HANNA & CO.

SALES AGENTS CLEVELAND, O.

M·A HANNA & Co.

PICKANDS, MATHER & CO.



Lighter "West Shore." Buffalo, N. Y.
Capacity 500 Tons per hour

FUEL LIGHTERS at Buffalo, Erie, Ashtabula, Cleveland. At Detour, Mich., a Fuel Dock equipped with shute capacity of 600 tons. Best quality Pittsburgh coal furnished at any time during day or night.

Western Reserve Building
CLEVELAND, O.

The Lorain Coal & Dock Co.

General Offices: COLUMBUS, OHIO

Producers and Shippers of ECLIPSE HOCKING AND CRESCENT PITTSBURGH COAL

Docks and Fuel Lighter LORAIN, OHIO

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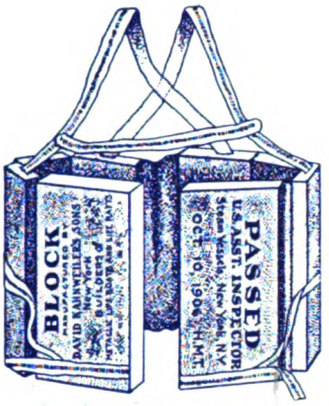


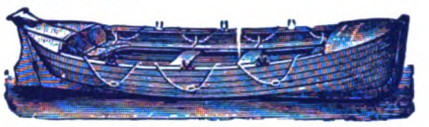
Solid Block Cork Life Preservers

Warranted 24 pounds. Buoyancy and full weight of Cork and Workmanship as required by U. S. Inspectors.

SAFEST CHEAPEST

SOLID CORK LIFE PRESERVERS
RING BUOYS AND FENDERS

Approved and adopted by U. S. Board of Supervising Inspectors. Also adopted by the principal Ocean, Lake and River Steamer Lines as the only Reliable Life Preserver. Awarded four Medals by World's Columbian Exposition.

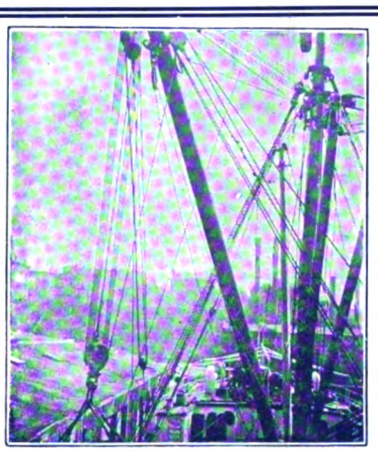


METALLIC AND WOODEN LIFE BOATS
METALLIC LIFE RAFT
MARINE DRAGS LYLE GUNS

WICKS' PATENT RELEASING BLOCKS FOR LIFE BOATS

DAVID KAHNWEILER'S SONS

260 FRONT ST., COR. DOVER ST. NEW YORK CITY



Durable Wire Rope Co.

93-95 Pearl St., Boston, Mass.

Durable Wire Rope will **Not Rust** or **Rot** and is not affected by **Salt Water** or **Climatic Conditions**

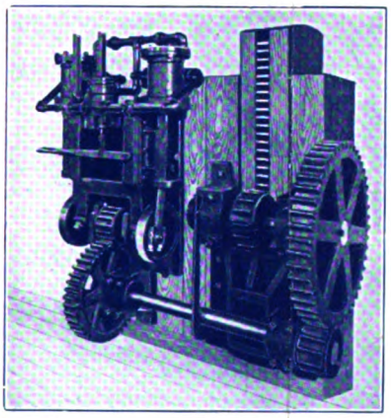
FOR

Mooring Lines	Towing Hawsers	Stevedoring	Tiller Ropes
Ship Rigging	Dredging	Boat Falls	Yacht Rigging
Hoisting	Coal Pockets	Pile Driving	Fasts

BRANCH OFFICES

165 W. Lake St., Chicago, Ill. *701 St. Clair Ave. N. E., Cleveland, O.*

NEW YORK AGENTS: HEGEMAN & WARD, 43 SOUTH STREET



Anchor Hoist Engines and Lock Plates

for Operating Dredge and Drill Boat Anchors

Double 6" x 6", 7" x 9" and 9" x 10" Throttle Reverse Engines

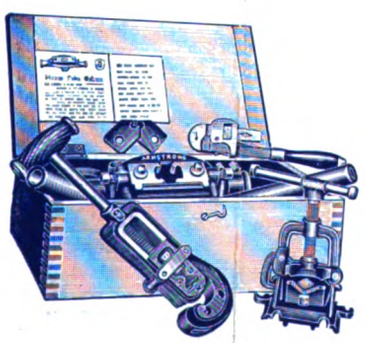
With Gearing to suit the size of Anchors

The Hoist is compact and efficient, and occupies no deck room. Any arrangement can be made to suit local conditions.

We build the engines with either throttle or link reverse, as well as non-reversible and for a great many purposes.

—BUILT BY—

Superior Iron Works Company, SUPERIOR, WIS.



ARMSTRONG COMBINATION KITS

CONSISTING OF

1 No. 2 Genuine Armstrong Stock	¼ in. to	1 in. R
1 " 1 Model B Pipe Cutter	⅛ "	1¼
1 Junior Hinged Pipe Vise	⅛ "	1¼
1 10 in. Stillson Wrench	⅛ "	1

STOCKS ARE FITTED WITH BARD ADJUSTABLE BUSHING
IN A HARD WOOD CASE
ENGINEERS AND FITTERS APPRECIATE THIS KIT.

Manufactured by

THE ARMSTRONG MFG. CO.

296 Knowlton St., BRIDGEPORT, CONN.
NEW YORK, 248 Canal St.

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Hyde Windlass Company

BATH, MAINE

—Manufacturers of—

Windlasses, Steering Gears, Winches, Capstans and other Marine Auxiliaries

HAND, STEAM AND ELECTRIC

Bronze and Iron Propellers

8 inches to 20 feet in diameter

TRADE PENBERTHY MARK.

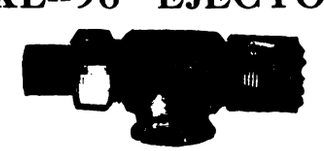
AUTOMATIC INJECTOR

No other INJECTOR on the market so simple, reliable or durable.

800,000 Engineers testify as to its merits. WORLD'S STANDARD.

The Penberthy Automatic is absolutely so, it is re-starting, self-draining. It is the ideal Injector for Marine use.

"XL--96" EJECTOR



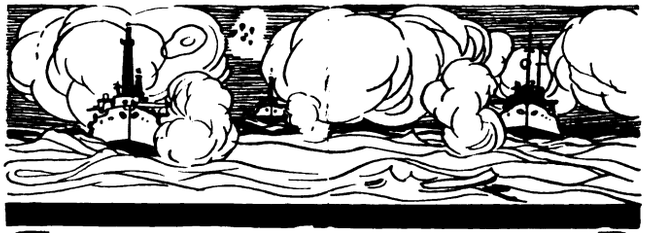
On account of the great elevating and lifting power of the "XL-96" when using a minimum amount of steam, it is at its best when replacing the bilge pump.

[Our No. 26 Catalog tells of these. Write for it—Now.

Penberthy Injector Co.

DETROIT, MICH.

Canadian Factory—Windsor, Ont.



Holding the Records in the Navies of the World

The records for Economy, Capacity and Endurance in the Navies of the World, are held by

BABCOCK & WILCOX FORGED STEEL

Marine Water-Tube Boilers

and

Superheaters

Moreover, the same superior characteristics have been proved in the Merchant Marine.

Do you know that Babcock & Wilcox Boilers and Superheaters in one vessel are saving more than 15 per cent over Scotch boilers in sister vessels?

Isn't such a great reduction in coal bills of very great interest to you?

All essential parts of Babcock & Wilcox Boilers are heavier than the corresponding parts in Scotch boilers, thus giving greater security against corrosion.

Let us send you full details explaining why "Babcock & Wilcox" stands for **safety, ease of cleaning** and **simplicity of operation.**

A large portion of our business consists of "repeat-orders." You know what that means. ***Write us at once.***

The Babcock & Wilcox Co.

NEW YORK and LONDON

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Annual Ship Building and Fitting Out Number

THE MARINE REVIEW

VOL. 46 CLEVELAND FEBRUARY, 1916 NEW YORK No. 2

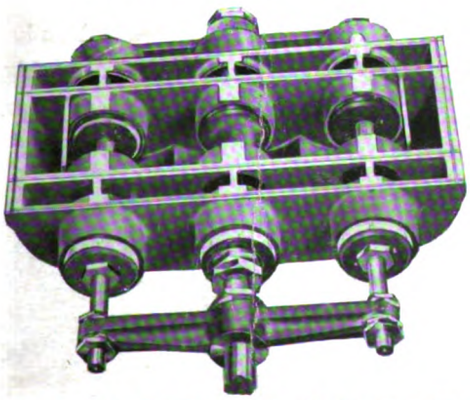
How Much Steam Could You Save

if your engine had no valve friction? The steam pressure load on slide valves is enormous and often leakage is great.

VAPOR TIGHT

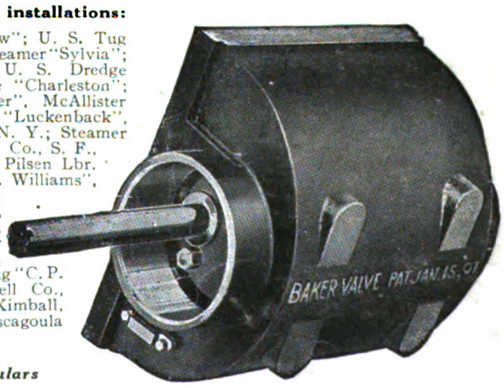
¶ Baker Balanced Piston Valves eliminate both leakage and valve friction because of our patented ring combination and cage. The engine will require no change to install this valve.

¶ Thousands of engines of all types have been equipped with Vapor Tight Baker Valves and Piston Rings and through nine years have experienced a saving of from 10% to 30%.



These are a few of our installations:

U. S. Steamer "Chickasaw"; U. S. Tug "Horace Harding"; U. S. Steamer "Sylvia"; U. S. Steamer "Poe"; U. S. Dredge "Wahalak"; U. S. Dredge "Charleston"; Tug, "John E. McAllister", McAllister Bros., N. Y. City; Steamer "Luckenback", Luckenback, S. S. Co., N. Y.; Steamer "Constance", Cal. Trans. Co., S. F., Cal.; Steamer "Kalkaska", Pilsen Lbr. Co., Chicago; Tug, "J. L. Williams", England Towing Co., Duluth; Tug "Henry W.", Lake Superior Towing Co., Bayfield, Wis.; Steamer "Mary Scott", John E. Doherty, Ashland, Wis.; Tug "C. P. Raymond", Fred B. Dalzell Co., N. Y. City; Tug "Lee Kimball, Jr.", Pascagoula, Miss., Pascagoula Towing Co.



Write for full particulars

BAKER VALVE COMPANY, 1859 E. 28th Street MINNEAPOLIS, MINN.

Alphabetical List of Advertisers, page 85 Contents, page 5 "Where-to-Buy," page 102 Classified Advertisements, page 92

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Morison Suspension Boiler Furnaces

For Land and Marine Boilers

Uniform Thickness **Easily Cleaned** **Unexcelled for Strength**

Also FOX CORRUGATED FURNACES

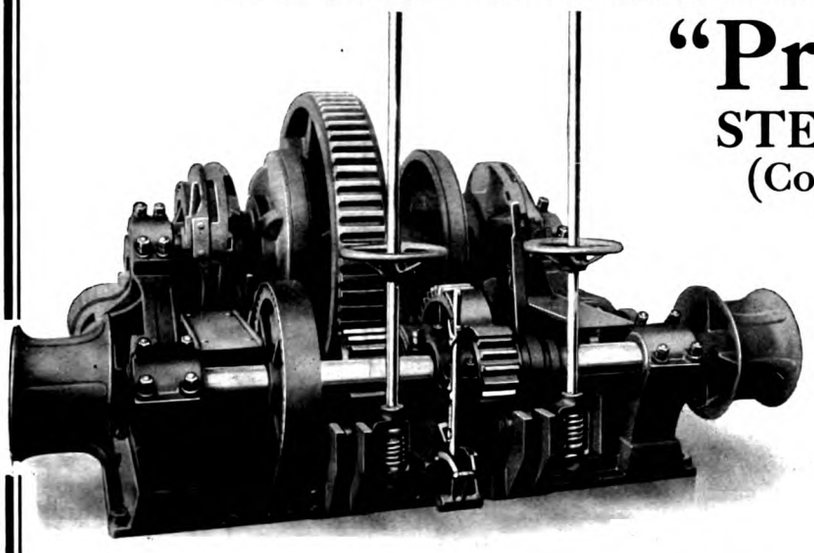
Manufactured by

THE CONTINENTAL IRON WORKS

West and Calyer Sts., BOROUGH OF BROOKLYN, N. Y.

Greenpoint Ferry from East 23rd Street, New York

"Having a PULL means having a friend in power who will act as a steam windlass for you." The



"Providence"

STEAM WINDLASS

(Compound Spur Gears)

has another kind of *pull*, and plenty of it. It has 15 per cent more *pull* than the worm geared types and at 50 per cent faster speed. You have been looking for just this combination. Our price will please you, too.

Write us today.

AMERICAN ENGINEERING COMPANY

SUCCESSORS TO AMERICAN SHIP WINDLASS CO. AND WILLIAMSON BROS. CO.

MACHINISTS AND FOUNDERS

PHILADELPHIA

15-312

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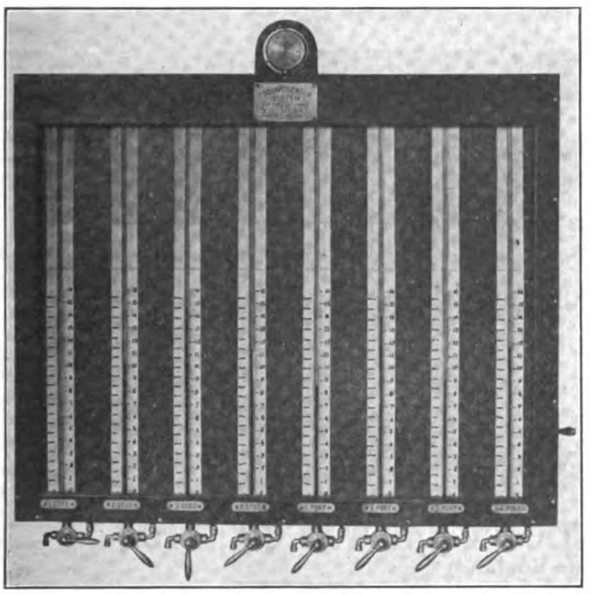
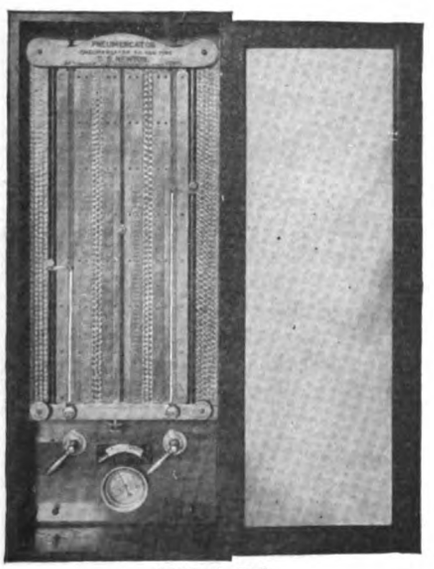
Now is the Time to Place Your Orders for Pneumercators



MODEL T-I

Located in Engine Room. Indicates depth and contents of ballast or fuel oil bunker tanks.



MODEL D-I

Located in Pilot House or Captain's Office. Indicates fore, midships and aft drafts. You can load to capacity in all kinds of weather.

A Partial List of Users

U. S. S. "NEW YORK"
U. S. S. "OKLAHOMA"
U. S. S. "PENNSYLVANIA"
U. S. S. "ARIZONA"
U. S. S. "IDAHO"
U. S. S. "KANAWKA"
U. S. S. "MAUMEE"

DESTROYERS

U. S. S. "PORTER"
U. S. S. "CONYNGHAM"
U. S. S. "No. 67"

U. S. LIGHTSHIPS

Nos. 101 and 102

S. S. "E. L. PIERCE"
Pioneer Steamship Co.
S. S. "SIERRA"
Oceanic Steamship Co.
S. S. "HERMAN FRASCH"
S. S. "FRIEDA"
S. S. "HEWITT"
The Union Sulphur Co.
S. S. "NEWTON"
N. E. Coal & Coke Co.
S. S. "GEORGIANA"
S. S. "SOUTHERNER"
YACHT "WHILEAWAY"
S. S. "H. F. FLAGLER"
Florida East Coast Ry., etc.

These instruments received two Gold Medals—the highest award at the Panama-Pacific International Exposition.

PNEUMERCATOR COMPANY, Inc.

118 Liberty Street, New York

OR

ORLANDO SUMNER
4 Bedford Chambers
Covent Garden, London

ALEXANDER HYND
872 Rockefeller Building
Cleveland, Ohio

G. E. LAWRENCE
Bullitt Building
Philadelphia, Pa.

J. C. H. FERGUSON
Monadnock Building
San Francisco, Cal.

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WORLD-WIDE RESULTS

are produced by the old reliable advertising columns of

THE MARINE REVIEW

Foremost in its field, THE MARINE REVIEW doesn't have to resort to extravagant claims. With unequalled thoroughness it has succeeded in covering the marine industry of America. This it quietly proclaims, yet seldom does it give voice to the constantly growing foreign circulation which is proving so valuable to all its advertisers.

Today the Pneumercator Company, liberal users of MARINE REVIEW space, have come forward with a letter from far Calcutta. It is an inquiry resulting from a recent MARINE REVIEW advertisement. Here's how it reads:

THE INDIA GENERAL NAVIGATION & RAILWAY CO., LTD.
(Incorporated in England)
4 Fairlie Place

Please address reply to
Managing Agents
General Dept.
POST BOX No. 157

CALCUTTA, 13th October, 1915.

REFERENCE No. M. 7126

Messrs. PNEUMERCATOR COMPANY,
118 Liberty Street
NEW YORK, U. S. A.

Dear Sirs:—

We notice an advertisement in the "MARINE REVIEW" of a Pneumercator to be used in determining the draft of vessels, and we should like to receive fuller details of this instrument.

We may mention that we are the owners of a large fleet of shallow-drafted vessels and any handy instrument which would enable us to determine the draft of our vessels would be of great advantage. We are not certain if your instrument would be suitable in this connection, our drafts being small, varying from 2' to 6'—6" maximum.

Yours faithfully

KILBURN & COMPANY

Managing Agents.

All of which proves one powerful fact:-that THE MARINE REVIEW, far and near, is regarded so earnestly by the marine executives who read it that every advertiser in its columns ***can't help but prosper.***

What's your reservation for next month? It's ***liberal space*** *that counts.*

THE MARINE REVIEW

CLEVELAND AND NEW YORK

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